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SEPTEMBER 2000

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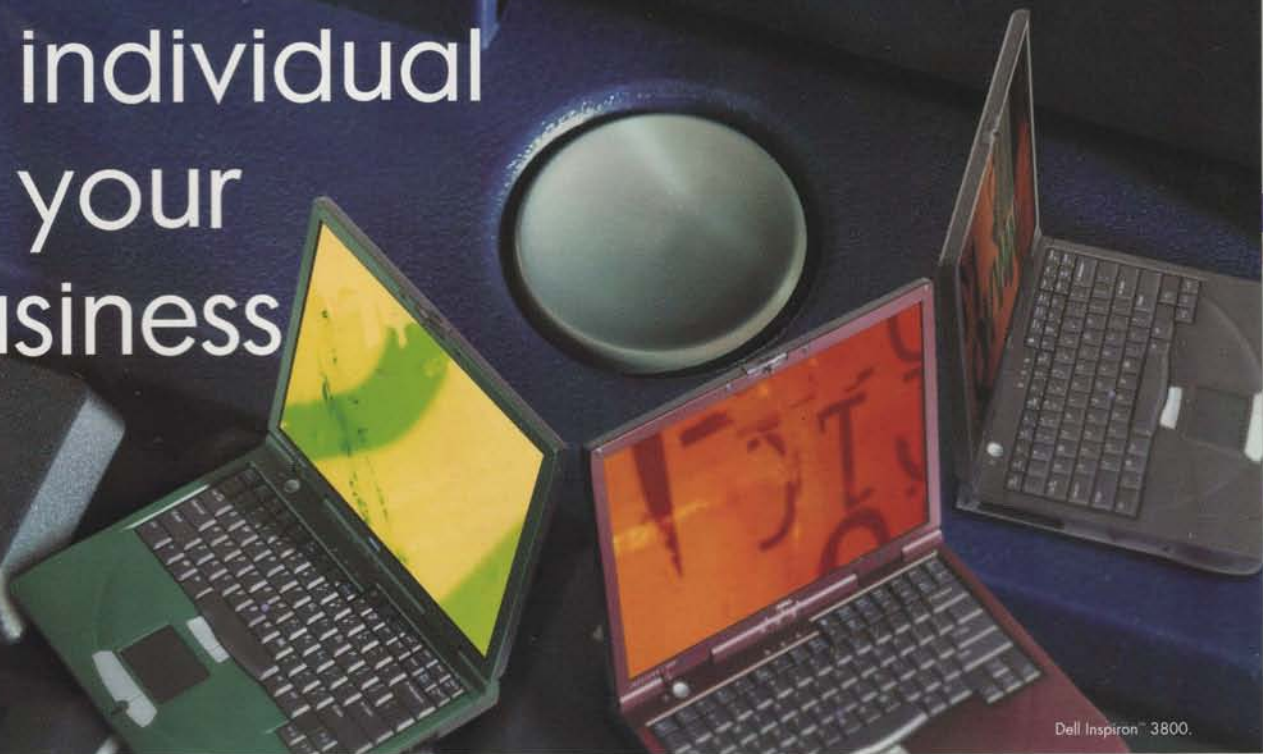
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power for peanuts

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Notebooks as individual as your business

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suspend



Dell Inspiron™ 3800.

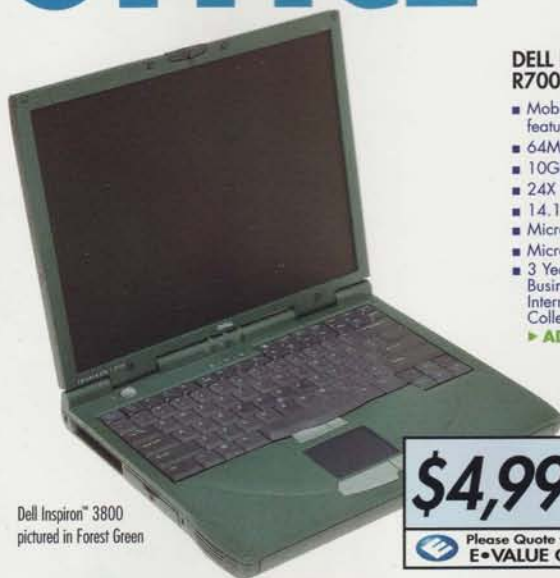
MOBILE OFFICE

It doesn't get much better than a compact notebook with an Intel® Pentium® III Processor 700 MHz. But we've added a 14.1" XGA screen for word clarity and crisp images, as well as a versatile media bay, with your choice of a CD-ROM or an upgrade to DVD-ROM drive.

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- 14.1" XGA Display
- Microsoft® Windows® 98 Second Edition
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► ADD: Inspiron Car Charger \$128*



Dell Inspiron™ 3800
pictured in Forest Green

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You can configure your Dell Inspiron™ notebook to meet the needs of every user in your company. And now you can also match the style of your notebook to fit the look of your company. The lightweight Inspiron 3800 is available in Tahoe Blue, Storm Grey, Forest Green and Sierra Marone. The range also includes the versatile Inspiron 5000 for high performance and convenience and the desktop replacement Inspiron 7500 for full graphics capabilities. These come with optional SXGA+ screens so they're as easy on the eyes as they are on your budget.

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- Microsoft® OEM Work Suite 99
- 3 Year Limited Warranty (Next Business Day On-Site Response* With International Coverage)
- Free Lifetime Telephone Technical Support*

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AWARDS

Australian PC Authority
June 2000 - Dell Dimension XPS
B800R was ranked second in
"Best Home PC Buy"
July 2000 - Dell Dimension XPS
B1000R SE named "Fastest PC" on the
A List August 2000 - Dell Dimension
XPS B1000R SE named
"Fastest PC" on the A List
Australian PC World
June 2000 - Dell Dimension XPS
B1000R named fastest PC on 'A List'
Australian Personal Computer
June 2000 - Dell Precision Workstation
220 won 'Editors Choice Award'

PC World
July 2000 - Dell Dimension XPS T700R
voted #2 in Home PC's Best Buys
July 2000 - Dell Dimension XPS
B800R voted #2 in Home
PC's Best Buys
July 2000 - Dell Dimension L500C
voted #2 in Business PC's Best Buys
August 2000 - Dell Dimension L600C
voted #2 in Sub-2000 PC's Best Buys
August 2000 - Dell Dimension L600C
voted #1 in Home PC's Best Buys
August 2000 - Dell Dimension L600C
voted #1 in Business PC's Best Buys
August 2000 - Dell Inspiron 3800
voted #3 in Power Notebook Category

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NO COMPROMISE DESKTOP POWER

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- 32MB NVIDIA GeForce 4X AGP Graphics Card
- SoundBlaster Live! Value 576Voice Sound Card
- 12X DVD-ROM
- 8X Sony CD-RW with Formatted Media
- Altec Lansing ACS-340 Speakers with Subwoofer
- 17" Colour Monitor (17.9" v.i.s.)
- Logitech 4-button Mouse-Man® Wheel (PS/2V)
- Microsoft® Windows® 98 Second Edition
- Microsoft® OEM Works Suite 2000
- Norton Anti-Virus 2000
- 56K Modem
- Telstra Big Pond ISP Offer
- PowerGame Pack II
- Free Lifetime Telephone Technical Support*
- 3 Year Limited On-Site Warranty (With Next Business Day Response)*

► ADD: HP LaserJet 1100A Printer/Copier/Scanner \$853*

NO COMPROMISE DESKTOP POWER

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- 15GB Hard Drive (7200rpm)
- UPGRADE TO: 20.4GB Ultra ATA Hard Drive (7,200rpm) \$90*
- 32MB NVIDIA TNT2 M64 4X AGP Graphics Card
- 48X CD-ROM Drive
- Harmon Kardon Stereo Speakers
- 17" Colour Monitor (15.9" v.i.s.)
- Microsoft® Windows® 98 Second Edition
- Microsoft® OEM Works Suite 2000
- Norton Anti-Virus 2000
- 56K Modem
- Telstra Big Pond Home ISP Offer
- 3 Year Limited On-Site Warranty (With Next Business Day Response)*
- Power Game Pack II
- Free Lifetime Telephone Technical Support*

► ADD: HP ScanJet 5300C \$538*

HIGH PERFORMANCE WORKSTATION

DELL PRECISION™ WORKSTATION 420

- Intel® Pentium® III Processor 733MHz/133 FSB
- Intel® 840 AGPset - Dual Processor Capable
- 256KB Integrated Full Speed Cache
- 256MB PC600 NECC RDRAM (expandable to 2GB memory when available)
- 10.2GB Ultra ATA-66 Hard Drive (7,200rpm)
- 3.5" 1.44MB Diskette Drive
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- Integrated Dual ATA-66 EIDE Controller
- Integrated Ultra 160/M SCSI Controller
- Integrated 16-Bit Sound
- 32MB ELSA SYNERGY FORCE Graphics Card
- 48X CD-ROM Drive
- 17" Colour Monitor (15.9" v.i.s.)
- UNIX 6.2 Operating System
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Dell Dimension™ B Series* photographed with options:
17" flat panel monitor and Altec Lansing ADA 880 speakers.



Dell Inspiron™ 5000



Dell Precision™ 220 pictured with
optional 17" flat panel monitor



Dell PowerEdge™ 2400 Server

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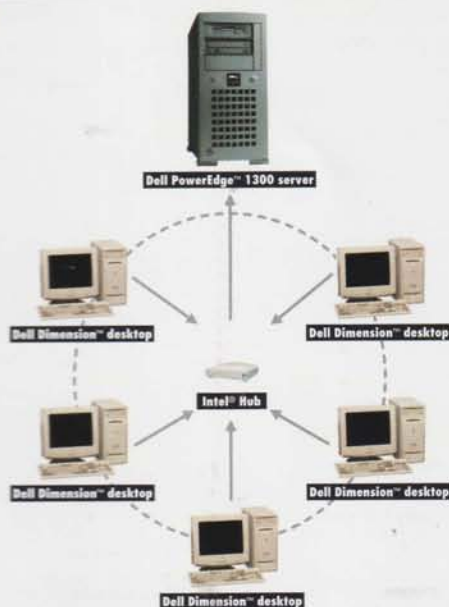
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- Suitable for mixed environments (NT, W2K, Netware, Unix, Linux)

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- 256MB SDRAM 2 x 9GB* HD
- Windows® 2000 Advanced Server
- Handle large web traffic loads within a small space (1 U footprint)
- Suitable for mixed environments (NT, W2K, Netware, Unix, Linux)

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- 8MB 2X AGP Video
- High-fidelity Audio SoundBlaster Compatible
- 8X DVD-ROM
- 15.4" SXGA Display
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- Microsoft® Windows® 98 Second Edition
- Microsoft® OEM Works Suite 99
- Leather Carrying Case
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- Free Lifetime Telephone Technical Support†
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- 8MB 2X AGP Video
- 3.5" Diskette Drive
- High-fidelity Audio SoundBlaster Compatible
- 8X DVD-ROM
- 15" Hi-Res SXGA Screen
- Microsoft® Windows® 98 Second Edition
- Microsoft® OEM Works Suite 99
- Carry Case
- ▶ **UPGRADE TO: Leather Carrying Case \$65***
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- 8MB 2X AGP Video
- RealPort CardBus Ethernet 10/100 & Modem 56 (32Bit)
- High-fidelity Audio SoundBlaster Compatible
- 15" Hi-Res SXGA Screen
- Microsoft® Windows® 98 Second Edition
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- Carry Case
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Budget Saver

DELL DIMENSION™ L SERIES DESKTOP

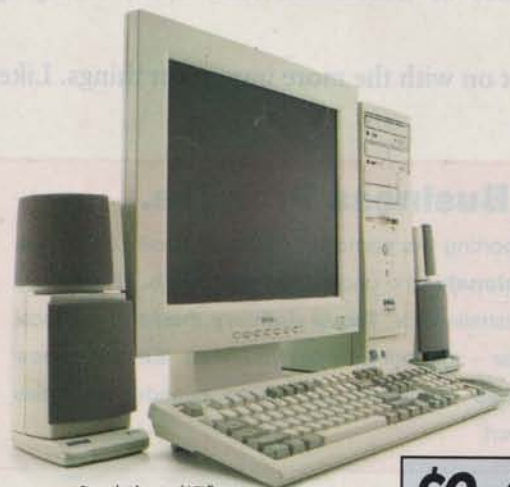
- Intel® Celeron™ Processor 566MHz
- **UPGRADE TO:** Intel® Celeron™ 600MHz \$99 (Offer valid until 8 September 2000)
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- **UPGRADE TO:** 20.4GB Ultra ATA Hard Drive (7,200 rpm) \$144*
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- 4MB Video Memory
- 48X CD-ROM Drive
- 15" Monitor (13.8" v.i.s.)
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- Microsoft® OEM Works Suite 2000
- Norton Anti-Virus 2000
- Telstra Big Pond ISP Offer
- 3 Year Limited Warranty
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Compaq International V.90 Modem
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Compaq S710 17" Colour Monitor
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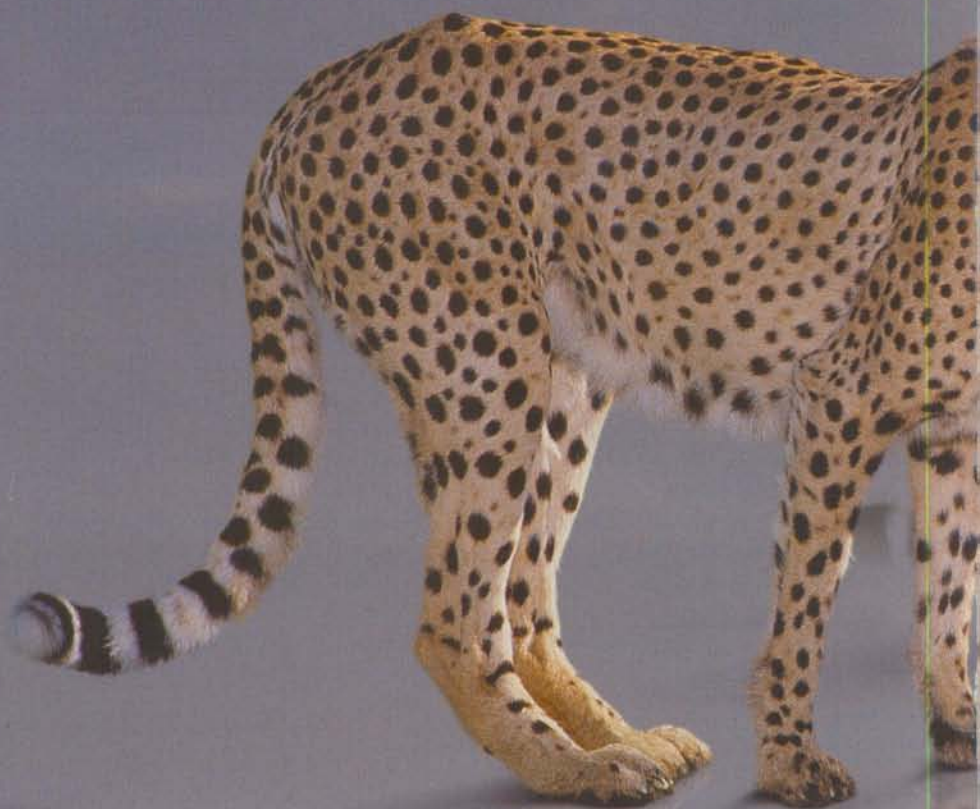
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APC has a new look and some exciting plans for the future.



Nathan Taylor

Nathan Taylor can be contacted at
apc@acptech.net.

A total makeover

Well, here it is. Our big redesign issue. We hope you like it. We've been aware for some time now that the magazine has been looking somewhat tired. With the redesign, we've made some improvements. The sections are easier to read; they now have colour coding and an index of contents for quick reference. Generally, the information you want should be easier to find.

In addition, we've revamped the After Hours section, and Interactive has now merged into GameZone.

Next issue, October, will see the debut of our new corporate section, an extra section of the magazine that deals exclusively with business and enterprise issues from an APC perspective. It will explain new business technologies, explore corporate issues and delve into how best to use technology in small, medium and large enterprises.

Our Web site, apc-mag.com, is also due for an overhaul, and we'll be rolling out a vastly improved version within the next month. The new site will feature far easier navigation, more content, a much improved search function and better organisation of serial columns such as our Java and C++ tutorials.

Over the last three months, you may have also noticed that we've been doing something different every issue: a new kind of reader offer, if you like. Posters, cover booklets and reference cards (such as the Linux card this month) are just the beginning. We have a plan that extends for the next nine months, and it includes offering you something special every month.

Next month will certainly be our biggest offer so far. The October issue includes a cover DVD — this is as well as

the regular two CDs. The DVD will have 4.7G of software on it, including heaps of music and video footage, as well as five full working commercial applications. And no, we won't be increasing the cover price.

Beyond October? Well, you'll just have to wait and see.

Don't be shy about telling us how we're doing. Working on a magazine like APC, it's hard to know whether the opinions we hear so often really represent our readers. For instance, Linux and Mac users often speak the loudest. I always like to refer back

to a 1996 article in *Byte* in which the magazine almost jokingly published a survey that it had run on its Web site. This survey showed that OS/2 was by far the most popular operating system in the world.

Then *Byte* went on to reveal the real figures. Its Webmaster had monitored the IP address of every respondent to check for duplicate submissions. On average, every person

who said they used OS/2 had voted 12 times. Windows users had voted just once. Mac users, from memory, had voted three or four times each.

I expect if the same poll were run today, you'd get a similar response for Linux to that of OS/2 back then. We certainly get a lot of Linux feedback, which has led to considerably more coverage of the open source OS than its market share justifies. Is this appropriate? Does it deserve as much coverage as we give it?

More generally, I am asking you this: is APC's mix of coverage right? Does the new design make life easier or more difficult? Are we, like so much of the industry, neglecting a silent majority? In short, what do you want from APC? Let me know via email at apc@acptech.net, or use the feedback form on our site. ■

Tell us how we're doing.

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Choose your own Linux adventure



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Handy Linux reference card



Never be stumped by the Linux command line again! APC's handy reference card lists all the most common commands, as well as useful Web sites and other information. Turn to page 128 to find your tear-out card. You can use the card flat or assemble it into a handy desktop pyramid for easy reference, as per the diagram above. And for light relief, Tux has got himself into some interesting situations on the flip side . . .



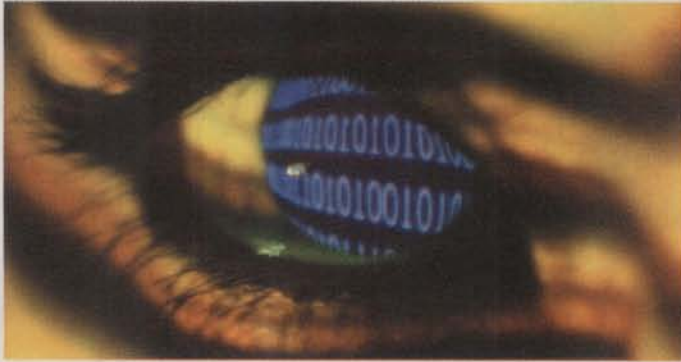
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The IT management problem

Garbage bags of marijuana, sex scandals and sudden resignations. Why is the IT industry plagued by dubious management practices? And why are CEOs of local companies resigning in record numbers?

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EYE OPENERS *Biometrics for real on your PC*



Not so long ago, the notion of securing your computer using fingerprints or retina scans belonged in the realm of science fiction. Now, biometric products for your PC are becoming increasingly common and sophisticated (no hacking off someone's hand to get in, for instance). *APC Labs* tests out the leading contenders, including products for hand, fingerprint and face recognition, and iris scanning, and examines the potential of future developments such as DNA scanning.

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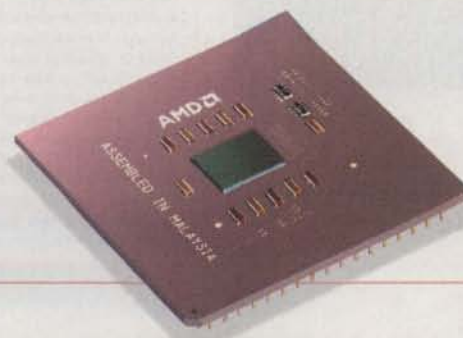
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Nanotechnology — the building of devices on the atomic level — may change the way we think about computing and the world we live in. Are the risks worth the possibilities? Nathan Taylor investigates the complex world of nanotechnology and examines some of the key controversies in this evolving area.

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Everyone knows that Windows 2000 has far more security options than its predecessors, but how do you make them work for you? Learn how to encrypt, set file permissions and control Internet access with our detailed guide.

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Conditions of entry

These conditions apply to all competitions in APC September, unless specific conditions are provided with the competition. Instructions on 'How to Enter' form part of the Conditions of Entry of all competitions in APC September. Entry is free and open to all residents of Australia other than employees of ACP Publishing Pty Ltd (ACN 053 273 546), suppliers of competition prizes, their families and associated agencies. The contests close last mail September 12. Entry according to the instructions supplied with the individual competitions. The judges' decision is final and no correspondence will be entered into. No responsibility is accepted for late, lost or misdirected entries. All entries become the property of ACP Publishing Pty Limited, the promoter, 54 Park Street, Sydney NSW 1028. The prizes are not transferable or redeemable for cash. Any change in the value of the prizes occurring between the publishing date and the date the prizes are claimed is not the responsibility of the promoter. Winners will be notified by security post and their names published in APC November.

Subscription promotion (page 95)

1. Information on how to enter and prizes form part of these conditions of entry.
2. Entry is open to all residents of Australia who subscribe to Australian Personal Computer between 16/08/00 and 5pm on 12/09/00 and PC User between 09/08/00 and 5pm on 05/09/00. Entry is subject to a valid signature against a valid credit card or, if payment is made by cheque, the cheque must be cleared for payment. Subscriptions are to be sent to APC, Reply Paid 3357, Sydney NSW 2001 or PC User, Reply Paid 3357, Sydney NSW 2001, or 13 61 16. Employees and their immediate families of the Promoter and its agencies associated with this promotion are ineligible.
3. The draw will take place at Level 9, Stockland House, 175-183 Castlereagh Street, Sydney, at 11am on 19/09/00.

Winners will be notified by mail and their names will be published in the November issue of APC or PC User respectively. Judges' decision is final and no correspondence will be entered into.

4. The first two valid entries drawn will each win a Versa Lite FX Notebook valued at \$3,753 each. The total prize pool is \$7,506. Prize is not transferable or exchangeable and cannot be taken as cash. Any change in the value of the prize occurring between 27/06/00 and the date the prize is claimed is not the responsibility of the Promoter.

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7. The Promoter may conduct such further draws at the same place as the original draw as are necessary on 02/01/01 in order to distribute any prizes unclaimed by that date subject however to any written directions given under Reg 37 of the Lottery and Gaming Regulations 1993 (SA).

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What's hot on APC September CDs

For a complete listing of programs featured on the September CDs, see the CD sleeve.

LATEST BROWSERS

Microsoft Internet Explorer (32-bit) 5.5

This is the latest version of Microsoft's full-featured Web browser. It offers 128-bit encryption and supports all the latest Web technologies.



Netscape Communicator 4.74

This is the latest release of this Internet software suite from Netscape. In addition to the Netscape Navigator browser, Communicator includes a complete set of tools for effective everyday communication. This release contains the Winamp 2.6 MP3 player, Macromedia Flash 4.0 and RealPlayer 7.0.



GAMEZONE SPECIAL: First person shooters

FPS games are one of the most popular genres in PC gaming today.

Here, APC delivers the cream of the crop, including Doom: Knee Deep in the Dead 1.9,

Duke Nukem 3D 1.3, Outlaws 2.0,

Quake II 3.14,

Starsiege: Tribes, Thief: The Dark Project, Unreal Tournament and Wolfenstein 3D 1.4. Find these classics on CD 2.



E-TAX 2000

Developed by the Australian Taxation Office, this package allows you to prepare and lodge your tax return over the Internet. The onscreen interview, inbuilt calculations, work sheets, validation checks and Help make it easier for you to complete your tax return. Once you have completed your tax return, e-tax provides an estimate of your tax refund or bill. Most e-tax assessments are issued within 14 days. To find out more, or to install e-tax, go to the Features section on CD 1.



Your guide to the cover CDs

The APC cover CDs complement both the magazine and apcmag.com. Each month's disc collection features software related to articles in that issue, as well as special CD-only features and Web browsers.

Each piece of software includes instructions on whether you will need to unzip the file before installing it, and most also include README files. A complete list of software included on this month's discs is included on the CD cover.

The CDs have been created in HTML. You do not need any special software to access the CDs, other than a standard browser.

The CDs have been tested using Netscape Navigator 3.0 and 4.0, and Microsoft Internet Explorer 3.0 and 4.0.

All software on the CDs is provided as is, without any warranty, express or implied. Complete terms and conditions are included on the CD itself; click on the Conditions of Use link for details.

How to run the CDs

Before using the CDs, please read the Conditions of Use online at apcmag.com/apcmag.cd. These CDs use an Autorun feature for Windows 95, 98 and NT systems. Just insert a cover CD and your browser will automatically load with the APC CD front page. Users of other platforms can simply launch their favourite browser and load the file DEFAULT.HTM in the root directory of the CD. For further information, see the instructions on the back of the CD insert.

You should carefully read the licensing agreements and honour any evaluation or shareware terms specified, read all instructions and README files, and virus-check every program before use.

While APC has taken every care to ensure that the software provided is useful and that it works, we cannot accept responsibility or liability for any of the products included.

If you have any problems, refer to the Help section on the back of the CD insert.

MP3 RIPPERS

This month on CD 2, APC has included an assortment of tools for your MP3 and audio needs: Audio Companion 1.06, Audio Converter 2.01, AudioCatalyst 2.01, BladeEnc 0.9, CD2MP3 1.1, CDex 1.20, CD-Runner 2000.72, Cool Edit 2000, Dionysus' MP3 Encoder 5, Easy CD-DA

Extractor 4.2.0, HyCD Play&Record 3.1.0503, Media Wizard 4.55, MP3 Creator 1.07, MP3 Home Studio 1.6, MP3 Strip It Digital 5.2.0.100, Rosoft CD Extractor 1.09, Sonique 1.51, Streambox Ripper 2.009, Ultimate Encoder 2.0 and White Tiger Standard 2.6.5.



IMAGE EDITORS

On CD 2 you'll find the latest in image editors. Whether you want to enhance your latest photos, create a collage masterpiece or animation, you can choose from a selection of professional and basic programs. Included are: Adobe Photoshop 5.5, Color Pilot 4.00, Digital Camera

Enhancer, HyperSnap-DX Pro 3.62, ImageForge 2.8a, Macromedia Fireworks 3.0, NeoPaint for Windows 4.0b, PaintShop Pro with Animation Shop 6.02, Repligator 6.0, Ulead PhotoImpact 5.0a, Ultimate FX 1.0, VCW VicMan's Photo Editor 5.23 and WebPainter 3.01.



HTML EDITORS

Due to a production glitch, some HTML editors on APC August CD 1 were corrupt and wouldn't install. We have included them on CD 1 this month. APC apologises for any inconvenience caused. The HTML editors included are:

Macromedia Dreamweaver 3, Adobe PageMill 3.0, Allaire HomeSite 4.5, EditLive 1.2, HotDog Professional 6.1, HoTMetal Pro 6.0.3.143, Namo WebEditor 3.06, ScriptWorx 4.11, NetObjects Fusion 5.0 and WebExpress 3.01.



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Insite

Like its print counterpart, APC's Web site is currently undergoing something of a renovation. We're redesigning the site to make it easier to use and navigate, and planning some exciting new options as well as retaining all your favourite features including the following:

- A complete archive of all magazine content, now in easy to navigate sections
- Reader discussion forums
- The latest news from Newswire
- Secure online subscriptions

And much, much more! Stop by **apcmag.com** this month and let us know what you think.

Meanwhile, the recently redesigned Newswire site offers you all the latest technology news, as well as new features such as interactive reader polls and our weekly GameSpy column. Check it out at **www.newswire.com.au**.



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If you'd like to write for APC, please email apc@acptech.net a brief résumé with an outline of your experience and interests, a sample of your writing and an outline of the article you have in mind. We appreciate submissions, but can't guarantee a reply.

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Telstra fails to deliver

ADSL prices due, but service stalls

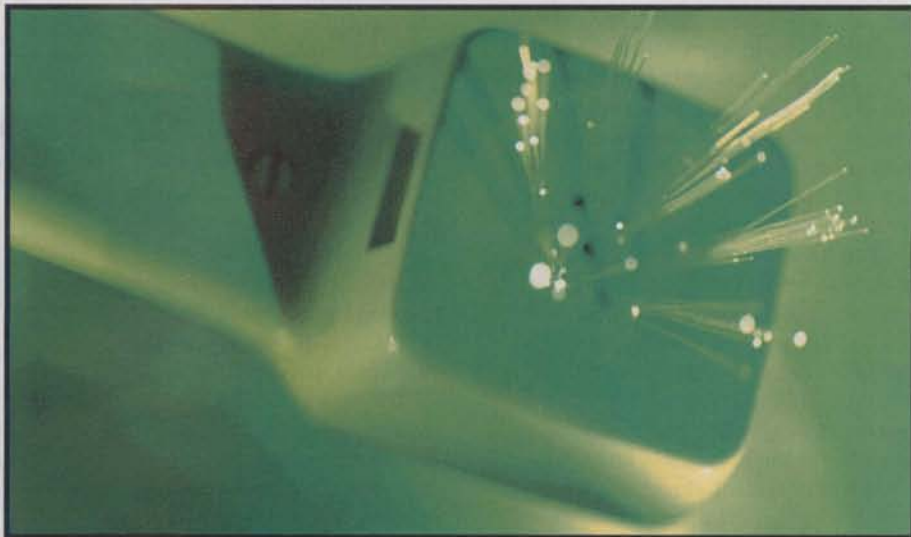
Despite fast-tracking its plans for ADSL services, Telstra is coming under increasing fire for its failure to deliver many data and telephony services, particularly in regional areas.

Telstra is due to announce complete pricing details for its long-awaited ADSL service this month. First off the rank will be a teleworking service known as Telstra

voice calls that can be carried on copper telephone lines. Mullane said ADSL cannot be installed on lines where pair gain equipment is used.

Technical limitations have already ruled many rural areas out of ever connecting to ADSL. Distance limits mean the service won't be available to anyone living more than 3.5km from a telephone exchange.

Telstra remains the dominant ISP for Australian users. By its own reckoning, it has around 650,000 paying customers,



HyperConnect, which allows teleworkers to transfer data at up to 1.5Mbps for a flat monthly fee. The carrier predicts that by the end of August, 200 exchanges — mostly in cities — will be equipped to provide ADSL. Telstra aims to provide high-speed DSL services over copper telephone lines to about 90% of its business and residential customers by mid-2002.

The effect of the announcement has been blunted, however, by Telstra's admission that the new service will not be available to many people living in metropolitan and suburban areas. A technical limitation means that homes with several telephone numbers but only one voice line won't be able to access the high-speed Internet service. Telstra's ADSL manager Dennis Mullane said the problem will be encountered in metropolitan areas, new housing developments and growing regional centres.

"This will be a substantial issue in certain areas," Mullane told an industry forum in Sydney.

The problem relates to the 'pair gain' equipment used to increase the number of

with up to 400,000 additional users registered on the telstra.com site.

Government policy is slowly moving towards recognising the telco's market dominance. Telstra has been blocked from participating in the next auction of mobile spectrum in a bid to increase competition in the mobile voice and Internet markets. Under rules designed in consultation with the Australian Competition and Consumer Commission (ACCC), Telstra will be barred from bidding on any 3.4GHz spectrum in a major population area (this covers all capital cities and some major regional towns). It will also be restricted to bidding for 44MHz of spectrum in regional areas.

Telstra has protested against the decision, just as it pushed for competitive restrictions in other areas to be eliminated (see APC August, page 24). At the same time, Telstra has joined with other telcos in arguing that it shouldn't be subject to minimum service guarantees in return (see 'Net service: Don't ask for guarantees', page 71).

Angus Kidman and William Maher

News roundup

Streaming's OK, but questions remain

Despite a partial victory on the issue of streaming multimedia, the Australian IT industry is calling for a major overhaul of broadcasting laws to make them more relevant to the Internet age. The Federal Government has determined that streaming multimedia on the Internet should not be considered broadcasting, but the hastily announced decision has done little to clarify its confusing policy on the matter. After coming under heavy pressure to abandon a proposed review of streaming multimedia online, which was introduced into digital TV law at the behest of the Opposition, IT minister Senator Richard Alston announced in late July that streaming audio and video would not be considered broadcasting when transmitted using normal Internet services. This decision was welcomed by the Internet Industry Association, which voiced industry concerns that classifying such content as broadcasting could jeopardise millions of dollars of local investment in content development. However, the IIA and other groups still want a more comprehensive review of the relationship between broadcasting and the Net.

ICANN sets domain date

The Web has moved a step closer to gaining new top-level domains following the setting of a timetable for their introduction. The Internet Corporation for Assigned Names and Numbers (ICANN), the body charged with introducing new domains such as .shop and .xxx to sit alongside existing favourites such as .com and .net, announced the timetable during a four-day summit in Yokohama, Japan. On August 1, ICANN will call for expressions of interest in establishing and managing a new domain. A \$US50,000 application fee will be charged. Applications will be accepted until October 1, and will be published online for public comment. By the end of November, ICANN hopes to enter into final negotiations with potential registrars. These negotiations are set to finish by December 31.

Web ad spend up

No-one's turning a profit from it yet, but Web advertising is continuing to grow as a business. Australian Web sites drew more than \$22 million in advertising in the three months ending in June this year, according to a survey by analyst group [www.consult](http://www.consult.com.au).

Ten advertisers spent more than \$100,000 each month in the five months to May. In June alone, local Web sites drew more than \$8.5 million in advertising, the survey found.

The estimates are based on data collected from 300 Australian Internet sites that accept paid advertising. Data is collected automatically, then 'confirmed' with advertising agencies, advertisers and publishers.

Officials from [www.consult](http://www.consult.com.au) said the results are evidence of continued strong growth in online advertising over the past three years. The group predicts that over \$100 million will be spent on Australian sites by the end of 2000.

Once seen as the main way for Web sites to make money, the Web advertising movement has lost some ground in the past year. In the US, online advertising leader DoubleClick has lost market value after analysts predicted a drop in its revenue. However, Yahoo reported revenue of \$270 million, an increase of 110% in the past 12 months.

William Maher

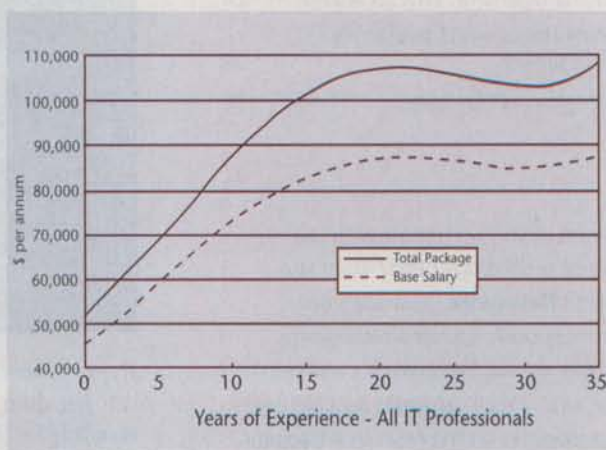
Tech salaries pipped by sales

The latest Australian Computer Society salary survey has revealed employees with technical skills in IT continue to be short-changed.

The report, '2000 Australian Computer Society Remuneration Survey', conducted by the Association of Professional Engineers, Scientists and Managers, Australia (APESMA), showed that on average, people with skills in sales and marketing earn annual incomes of \$164,263. In comparison, people working in systems management earn \$84,559 and programmers/analysts \$65,354.

People with technical skills are not the only IT workers to receive relatively low pay. Last month, 'The Salary Survey 2000' conducted by Hays Personnel Services found that IT salaries varied according to job location (see APC August, page 24). Pay disadvantages are determined by region as well as skill type.

On the upside, IT professionals achieved average salary increases well above other sectors in the Australian economy. According to the survey, IT salaries rose 5.1% on average during the 12 months to April 2000, compared to the 3.6% increase in average weekly earnings recorded by the Australian Bureau of Statistics (ABS) during the 12 months to February. Average salaries take eight to 10 years to achieve (see chart).



APESMA research and surveys manager Dominic Angerame said that of the programmers and analysts who took part in the survey, most had programming skills in a variety of applications. "Those who are skilled in COBOL reported the highest income packages, at \$68,400 per annum, while packages for workers with Visual Basic only totalled \$60,487 per annum," he said.

Angerame also said that in the short term, GST managers and IT managers are expected to reap the greatest financial rewards. "In the medium term, improvements to enterprise networking, the growth of the Internet and the major expansion of telecommunications make for profitable times ahead for IT personnel who are skilled and experienced in this area," he said.

Howard Dahdah

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News roundup

Big business gets into B2B

The use of the Internet for business-to-business (B2B) transactions has received a major boost with the announcement of a mega-alliance between 14 of Australia's largest companies. Amcor, ANZ, Australia Post, BHP, Coca-Cola Amatil, Coles Myer, Fosters, Goodman Fielder, Orica, Pacific Dunlop, Qantas, Telstra and Wesfarmers have joined forces in a venture known as corProcure. The system's development will be supervised by Pricewaterhouse Coopers, and it is expected to be working by September. While the companies haven't predicted potential cost savings from the venture, more than \$8 billion of indirect spending is expected to pass through the system in the next year.

Sony notebooks hit Australia

Sony has made a belated entrance into the Australian PC market with the launch of its Vaio (pronounced 'vy-oh') range of notebooks. The corporation, best known for its Discman and PlayStation products, acknowledges the notebooks will be up against some stiff competition. Having sold Vaio in Japan since November 1997, Sony is expecting to sell 6,000 units in Australia in the first 12 months, which it says equates to a 2% share of the market.

Napster blocked by judge

As APC went to press, music sharing service Napster had successfully stayed an injunction that would have forced it to shut down. The proposed shutdown caused a furore in the online community, but the ultimate fate of Napster remains in the hands of the court. The injunction was the result of a court case bought by the Recording Industry Association of America against Napster earlier this year, saying it knowingly assisted in the violation of copyright law and facilitated piracy. Napster has argued that under US law, people are entitled to make their own personal copies of copyright material, and that distributing them via Napster is thus legal.

Who wants to be a CEO?

Heads roll at eisa, Sausage, LibertyOne

The consequences of April's tech stock crash continue to be felt, but now it's the company heads rather than the investors who are feeling the heat.

The past month has seen a number of CEOs and other key executives in listed local technology companies wave goodbye to their highly paid jobs (though often not to their stock options). Sausage, E*Trade, LibertyOne, eisa and LookSmart are among the companies that have seen a switch at the top. The reasons behind the moves are many and varied, but the overreaching effect of the

However, many of those collapsed following the April tech stock rout. Sausage has since regained some momentum through a merger with consulting group SMS, whose head Lloyd Roberts has taken over as Sausage's new CEO.

E*Trade CEO Kerry Roxburgh was next to join the list of deposed execs when the company announced that his two-year contract wouldn't be renewed. Roxburgh will continue as a 'director on special assignment'.

Roxburgh is being replaced by former US E*Trade executive Michael Deleray. The company is predicting it will reach profitability in the next financial year, a goal which was not achieved during Roxburgh's reign.



LookSmart Australia was able to put a more positive spin on its CEO switch. Tim Pethick, who formerly held the role, is moving on to head up LookSmart's joint venture with BT. The joint venture between the two companies was announced last November. His place is being taken by Jason Kellerman.

Not all departures were as amicable. eisa CEO Damien Brady abruptly resigned from the troubled ISP in late July amid vague threats of legal trouble. Even Austar, which is planning to buy out eisa, appeared unaware of the reasons for his

departure.

tech stock shake-out, which has seen increased pressure on executives to guarantee profitability, can be seen in many of the changes.

Web developer Sausage began the rush when founder and former CEO Steve Outtrim quit the company. Outtrim managed to make \$60 million by cashing in shares before he departed. Once he'd left, new CEO Wayne Bos wasted little time in sticking the boot in, describing Outtrim as "uncouth" at an industry luncheon.

Outtrim's period at Sausage was marked by both highs and lows. At one point, the company seemed certain to sink, but with Bos at the helm, a series of high-profile deals have been completed.

Online media company LibertyOne has also continued to keep its highly-used executive revolving door in use. The company appointed its fourth CEO in less than two years in late July, when Graham Bristow stepped down from the post. Bristow will be replaced by Marcelle Anderson, who was formerly the general manager of LibertyOne's strategic investment group.

Despite all this reshuffling, CEO posts don't seem to have lost their appeal. Paul Twomey, the head of NOIE, the main government info-tech department, has departed from that role to seek a new job in the private sector.

Angus Kidman

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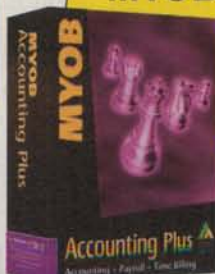
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News roundup

Edge in liquidation

Creditors of the failed Edge Group computer companies have voted to place the company into liquidation and will consider suing Edge director Johnson Wang for insolvent trading. "Administrator Alan Topp said the company was in trouble from early 1999 and estimates the total debt of the Edge Group to be \$36.5 million. Topp said that now Edge is officially in liquidation, creditors are free to pursue Edge directors Jen-Tse 'Johnson' Wang and his wife Phynia Wang for insolvent trading. Topp said creditors could claim \$5 million from the pair.

56K modem spec updated

Despite all the excitement about high-speed Internet, officials haven't forgotten about the analog modem. A new modem standard is being prepared which will improve the speed of data sent from modems by over 40%, improve startup times and allow the modem to be put 'on hold' when an incoming telephone call is detected. The International Telecommunication Union (ITU) said the standard will be ready for approval by November this year. The new speed increase only applies to outgoing data, meaning the benefits will only be seen in cases like videoconferencing or making phone calls on the Internet.

G4's a square meal for Apple

Apple has rolled out a new cube model of the Power Mac G4 and expanded the range of colours in its consumer iMac model. At Macworld, Apple CEO Steve Jobs showed off the Power Mac G4 Cube, which measures 20cm square and houses a 450MHz PowerPC processor. The company has also added a new dual-processor G4 to its range. In addition, Apple has souped up the consumer-friendly iMac range, introducing four new colours: indigo, ruby, sage and snow.

.com.au monopoly extended

Melbourne IT has ensured that it will maintain its monopoly on .com.au name registrations for as long as possible by providing funding to the body which plans to open up the domain space for competition.

In a new deal, Melbourne IT has agreed to provide up to \$659,000 in funding for .au Domain Administration (auDA), which is currently working on a competition policy for local domains. The sum represents about 80% of auDA's budget, reflecting the market share of the .au space held by Melbourne IT, the company said in a statement to the ASX.

In return, Melbourne IT will maintain its stranglehold on .com.au domains until auDA's Competition Model Advisory Panel proposes and ratifies a new model. Nominations for that panel only closed in late July, and auDA has estimated that the process of establishing a policy will take at least a year. Melbourne IT has predicted that the new policy is likely to be put in place "on or after" October 2001, when its licence expires.

"Melbourne IT is confident that the auDA Board will develop forward-looking policies that will earn the support of all the industry stakeholders, especially Australian end users, and the Australian Government," the company said in the statement. auDA has also signed similar deals with the registrars for the other major Australian domains, .net.au, .asn.au, .edu.au, .csiro.au and .gov.au.

Melbourne IT was exclusively licensed in late 1996 to register .com.au domain names by University of Melbourne staff member Robert Elz, who established the local domain. The local industry has long called for more widespread competition, and formed auDA to foster this. auDA was awarded control of the .com.au namespace in November last year, but Melbourne IT's existing contract for its Internet Names Australia division doesn't expire until October 21.

On the back of its monopoly,

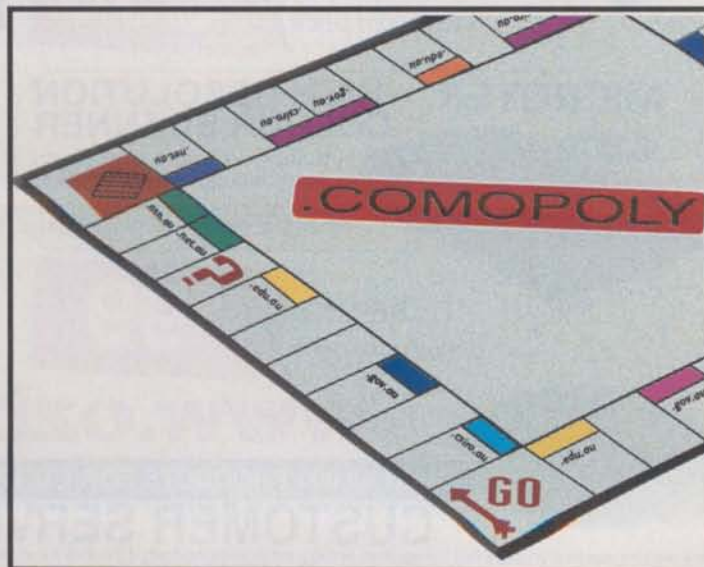
Melbourne IT managed to float at a 370% premium on the ASX last December. However, it has since been plagued by allegations that the float was underpriced and poorly organised. auDA has also enjoyed its share of controversy after the rapid departure of CEO Joseph O'Reilly after a month in the job. O'Reilly said auDA was underfunded — a problem the new arrangement may help alleviate.

In other domain news, political statements and value judgements will be banned in the .gov.au domain space. The Online Council, which administers all government activity online, has adopted new guidelines to ensure consistency in domain administration across all Australian jurisdictions. The guidelines state that domain names used by government bodies must not "prejudice the reputation or credibility of the .gov.au domain".

No personal or geographical domain names will be allowed in the .gov.au space, including the names of electoral divisions. Only Australian government departments, agencies and statutory bodies can use the .gov.au domain space. The domain name must show a direct link to the name of the government body or function of a particular project.

Government bodies must submit an application to the Office for Government Online or the relevant State domain administrator with an explanation of their intended use of the name. The guidelines must be used by all government departments in formulating an Online Action Plan, due by September.

Angus Kidman and Fiona Angus



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Garbage bags of marijuana, sex scandals and sudden resignations.

Why is the IT industry plagued by dubious management practices?

Sleaze of use: The IT management dilemma

The resignation in May of Chris Tyler, expatriate American CEO of Australian accounting software company Solution 6, hit the front page of national newspapers. It came after *BRW* revealed his 1985 conviction in South Dakota for possessing 'a couple of garbage bags' of marijuana.

The mainstream media's fascination peaked when Tyler freely admitted the offence and tried to play it down. Revelations of his involvement with failed Canadian company Lessonware didn't help, but Tyler only quit when newspapers revealed an arrest on suspicion of selling cocaine in 1981.

Was Solution 6 aware of its CEO's dark past? Do recruiters sometimes bypass the usual checking procedures to get around the shortage of IT professionals? Did Solution 6 even care? Opinion is always divided over whether this type of revelation should affect someone's career. Tyler was not the first to depart in this manner. Numerous CEOs have left IT companies in recent months (see 'Who wants to be a CEO', page 68), and for some, the departure has been highly dramatic.

An industry trend?

On the morning of April 17 this year, Spike Networks announced that its founder, Creed Chris O'Hanlon, had resigned due to ill health. The *Sydney Morning Herald* quickly ran a long exposé alleging that O'Hanlon was forced out. He left behind him a sexual harassment claim (reputedly later settled for \$1.2 million), a mistress who allegedly stole \$US\$3,000 from Spike, and a series of huge bills which had sapped the company's funds.

Perhaps best known for his flamboyant style, O'Hanlon boasted Spike would become "the Disney or the News Corp of tomorrow" and predicted Spike Radio would dominate the 'youth nation' of the global Internet. Since his departure, the company has conservatively repositioned itself as a corporate Internet consultancy. Extravagant parties and mansions on the US west coast are a thing of the past.

In another case, online education com-

pany NextEd was forced to defend its new chief operating officer, Dr Alan Bowen-James, when *NewsWire* revealed that he was struck off the medical register in 1991 for professional misconduct. Bowen-James was charged by the Medical Tribunal of NSW after allegations by a former patient that a consensual sexual relationship had existed. He denied the charge, but the tribunal found for the patient and he was prevented from practising for three years.

A NextEd spokesperson said Bowen-James was hired for his "extensive senior management and consulting experience". His blemished past was not an issue and he remains with the company.



Then there are industry stalwarts like Ian Penman, managing director of Compaq Computer Australia, who addressed a 1996 press conference as follows: "At Compaq, we will probably have \$4 billion in cash reserves by the end of the year. Basically there are five ways that you can spend that, not including women [booing from the audience] . . . I'm a chauvinist, I admit that."

Could Penman talk this way if he was the head of Westpac? Or if he ran Coles Myer? Such insensitivity could well make national headlines, and women's interest groups might even encourage a boycott. But the majority of Compaq's customers are men. The technology media reported the quote with raised eyebrows only and Penman got on with selling PCs.

The recruiter

Felix Borenstein, principal of Melbourne recruitment firm Parkside Consulting, acts for two of the companies mentioned above. He argues that there is no more scandal in technology companies than elsewhere.

"I think the IT industry is more high-profile than other industries, so you tend to hear about these things more," Borenstein said. "The Chris Tyler thing, for example — that was on the front page of every newspaper for how long? If it was the CEO of a brick manufacturer would it have been there?"

Parkside typically does four or five reference checks on candidates for senior positions. Referees are often nominated, but the company also does its own research, especially when the candidate is from overseas.

"I mean we actually reference-check the referees!" Borenstein said. "After we've done a reference check we then ring back and ascertain whether the referee is who they say they are."

He agreed the big dollars on offer at high levels in IT companies have the potential to attract some undesirable characters, but said candidates undergo a barrage of psychological profiling.

Borenstein denied there is a bias towards male employees: "If we dealt with a client who said, 'I don't want to see people with X background or Y gender or B sexuality', we'd say, 'Sorry, we can't help you.'" However, he stressed that the loss of female employees after maternity leave adds to the skills shortage, and said the government needs to do more to encourage women to return to the workforce, particularly by reducing child-care costs.

"The IT sales industry attracts people that are very confident, very motivated, and I guess they live hard and to some degree they play hard. But that's not everybody," Borenstein said. "The nature of startups, especially in the Internet space, means that senior management in startups mightn't quite have the skill set of senior management in some other types of organisations."

Simon Vandore



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Despite rapid technological advancements, major telcos are still reluctant to offer a guaranteed level of performance.

Net service: Don't ask for guarantees

Conventional thinking holds that introducing competition into the telecommunications market will result in better service and prices for consumers. However, while pricing has continued to drop, telecommunications companies appear reluctant to provide any guarantee that an agreed level of service will be available.

The major Australian telcos have told the Telecommunications Service Inquiry not to burden them with service guarantees. At a special meeting of the inquiry to allow telcos to justify their service standards, inquiry chairperson Tim Besley described the telcos' position as "largely pro-competition and anti-regulation". The inquiry is part of the Federal Government's 1998 election promise to conduct an investigation into telecommunications service standards across Australia before any further sell-off of Telstra.

Questioned by Besley, Telstra said it opposed laying down minimum Internet download speeds, citing rapid advancements in technology. Most of the inquiry has been dominated by complaints about the lack of availability and choice of telecommunications services in regional areas.

The major target of the inquiry, Telstra, claimed it has sunk \$5.75 billion, or nearly half its total network investment, into regional Australia. Telstra regulatory director Deena Shiff said Telstra is making a loss from servicing regional areas. "The existing USO arrangements are not a pot of gold," she said. "There appears to us to be a failure by other companies to invest outside the capital cities."

Regional telco Austar pointed out that it is not economically viable for companies to provide the same level of service in regional areas because of distance and population ratios. "Regional Australia has got to accept fewer choices because that is all the market can support," Austar head of corporate affairs Bruce Meagher said.

Optus director of regulatory and public affairs Paul Fletcher also opposed regulatory guarantees. "The reality of competition is that losing customers keeps a company's feet to the fire more than regulation does. If the government intervenes early, it risks choking off new technology," he said.

Fletcher pointed out that mobile phone and Internet services are available every-

where in Australia, but people living in regional areas must carry the higher costs of delivering the services unless the government chooses to introduce subsidies.

Vodafone regulatory policy manager Chris Dalton strongly rejected any attempt to force Vodafone to open its mobile network to other telcos to enable wider mobile phone coverage. "It is just a matter of time before prices come down. For government to start mandating services is crazy."

Joining this chorus against regulatory guarantees, One.Tel corporate counsel Tracey Moore told the inquiry that its network-sharing agreement with Telstra has been a success and that roaming regulations are unnecessary. Moore opposed service guarantees on the grounds that One.Tel is unable to deliver them because it does not control its own network. "One of the limiting factors for us is access to infrastructure," she said. "We are dependent on Telstra to deliver our customer service guarantee."

AAPT legal and regulatory director Brian Perkins argued that there is more demand for telecommunications services than telcos can cope with. "What's taking up bandwidth space is all this extraneous junk on the network." Under questioning by inquiry panel member Jane Bennett about the push by many regional communities to obtain a service guarantee, Perkins retorted: "There is no such thing as a guarantee."

The inquiry has received 1,000 submissions and is due to release its findings on September 30.

No service, no smile

Despite protests from telcos that they're keeping up with demand, Australia's dissatisfaction with telecommunications companies is growing.

The latest Telecommunications Performance Monitoring Bulletin by the Australian Communications Authority (ACA) found the number of complaints increased significantly in the March 2000 quarter compared to the same quarter last year.

Telstra recorded 71,010 complaints, up 35% from the March 1999 quarter. OnAir, the telco's mobile division, reported a whopping 130% increase in complaints, while business and residential-related gripes rose 24% and 37% respectively for the same



period last year. Telstra officials said implementation of a new technology system "resulted in a higher rate of complaint recording . . . which shows a notable increase compared to the previous quarter".

However, if Telstra complaints are increasing, the length of time taken to deal with complaints is decreasing. The ACA found that Telstra met its Customer Service Guarantee (CSG) obligations in up to 97% of cases, an improvement over 1999 figures.

Telstra's key rival, Optus, recorded a relatively low 405 complaints for the March 2000 quarter. This was an increase of 73% over the March 1999 quarter, but down 17% from the December 1999 quarter. Most complaints related to billing, local call resale and customer service.

AAPT escaped criticism after failing to produce figures relating to complaints. In a statement to the ACA, the telco said it had introduced a new system to record complaints which failed to produce accurate information. "In carrying out these activities, the systems were inadvertently compromised and faulty data produced," AAPT officials said.

On the mobile front, ACA monitored the call dropout and network congestion of Telstra, Optus and Vodafone in each State. Tasmanians using Optus experienced the greatest dropouts, while ACT users on Vodafone were best off. In New South Wales, mobile phone users on the Vodafone network encountered the least number of dropouts.

Fiona Angus and Roulla Yiacomini

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While Sony gears up for the October launch of PlayStation2 in Australia, a surprise threat is emerging in the form of a Linux-based console promising free games.

The Penguin versus the PlayStation

Out of the box, you can hook it up and begin playing unbelievably realistic 3D games, browsing the Net at high speed or just enjoying personal TV or MP3 favourites. Put one in your living room, den or your kids' bedroom."

This might sound like the kind of hype you'd expect from Australia's gaming console market leader, Sony, or either of its two major rivals, Sega and Nintendo. It might also have come from Microsoft, which is hoping to make a major splash with its X-Box console.

However, this vision comes courtesy of Indrema, a new player in the console market with one key point of distinction: it plans to build a console based around Linux and offer open source games developers a chance to reach the mass market.

Since March, Indrema has been hyping its plans for the L600 home entertainment console, which is due for release in the US in the middle of next year. Like Sony's PlayStation, it will offer dedicated gaming, Internet connectivity and optional extras like a wireless keyboard and extra storage. Unlike PlayStation, the system will run on an embedded Linux derivative.

While using Linux provides an immediate, low-cost back end, the real appeal for Indrema is that Linux possesses a huge pool of developers. The company will charge a fee to certify games for the platform and collect a royalty on software, just as Sony and other console companies do.

Around 30 developers are lined up for the initial release.

Crucially, developers will be able to release games for free if they wish — something that's never likely to happen in the tightly controlled Sony empire. Indrema will also encourage the use of its built-in disk storage for accumulating MP3s, something which Sony, as a conventional record company, is less likely to embrace.

Sony hasn't entirely ignored the potential of Linux. The development kits for PlayStation2 games include the capacity to run Linux software. However, Sony's aggressive attitude towards protecting its intellectual property — evident in its ongoing lawsuit with PlayStation emulation developer Connectix — means it is unlikely to move towards the open source model. Indrema will be keeping certain elements of its embedded Linux private, but plans to release source code for others.

What's in the box

Few technical details of the proposed Indrema platform have been confirmed. Officials have said the system will use an nVidia graphics chip and an Intel-compatible processor running at about 600MHz. The embedded Linux used by the product, dubbed DV Linux, will be able to

decode DVDs — a key point in competing with PlayStation2. It will also allow high-speed Net connections, including DSL and cable options, using its built-in Ethernet card. The built-in Web browser will use the Gecko rendering engine developed by Netscape's open source arm Mozilla. Media reports suggest the machine will also have four USB ports, 64M of memory and a high-capacity hard disk drive.



Although Indrema's console isn't expected to be released until 2001 (and a PAL version for Australia is even further down the track), customers are already able to pre-register to order the product from the company's Web site. Initially, interest is expected to come from dedicated Linux gamers, but Indrema is also targeting hotels as possible customers.

The Linux market is certainly keen on gaming. Anthony Rumble, founder of local Linux specialists EverythingLinux, told APC that when the company held a sale on Linux games earlier this year, most titles sold out within 24 hours.

Of course, this market is small compared with the PlayStation. Sony has sold well over 1.5 million units in Australia, and fire sales on existing PlayStation units in preparation for the October launch of the PlayStation2 are likely to boost that market share further. The new unit will cost more than its predecessor (between \$600 and \$700), but includes DVD playback and a range of add-on options.

For Sony, the console sale price is largely irrelevant. The bulk of PlayStation income is generated by the games, which are much more expensive (relatively speaking) than the unit. A new-release PlayStation title typically sells for between \$80 and \$90. If Indrema can convince developers to offer games for a fraction of that price (or, indeed, for nothing), and can maintain Linux's legendary stability in a more controlled environment, it may well have a hit on its hands.

Angus Kidman

Illustration by: Warren Taylor



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Duron: Power for peanuts

AMD kicked Intel where it hurt the most last year when the Athlon starting taking chunks out of the high-end PC market and beating Pentium III to significant performance milestones. Now AMD has returned to its familiar stomping ground of budget PCs and introduced the Duron, a powerful processor at a budget price. Can AMD take on Chipzilla again and win? Josh Mehlman finds out.

Soon after switching to the 0.18-micron Coppermine design for the Pentium III processor, Intel beefed up its range of Celeron processors by using the Coppermine core with half the level 2 cache. This gave Celeron a couple of advantages over the AMD K6-II and K6-III processors: the new Celeron could reach speeds greater than 500MHz and had the same SSE SIMD instructions for multimedia processing as the Pentium III.

AMD countered by pulling the same trick, converting its 0.18-micron full performance processor into a budget processor by removing some of the level 2 cache. Celeron has 32K of level 1 cache and 128K of level 2 cache, making a total of 160K.

AMD's new Duron has 128K of level 1 cache and 64K of level 2 cache, totalling 192K.

Intel seems determined to cripple the Celeron by running it on a 66MHz bus to differentiate it from the Pentium III. For the Duron, AMD has used the same 200MHz bus as the Athlon. Because of this, Duron should have no trouble running at 1GHz or even higher. Duron also has SIMD instructions for multimedia processing.

Since AMD has integrated the level 2 cache into the Athlon and Duron chips, it can now do away with the bulky cartridge that was required for the original Athlon, and its Slot A interface. As Intel did with the Pentium III, AMD has reverted to using the PGA (pin grid array) format for its processors. However, it does not use the 370-pin Socket 370 connector that Pentium III and Celeron processors use. Instead, it uses a 462-pin socket connector called Socket A or Socket 462. This means those with older Athlon systems will need a new motherboard if they want to upgrade to a new Athlon processor. It also means that people who buy a Duron-based machine will be able to upgrade to an Athlon if they need more processing power.

In a nutshell

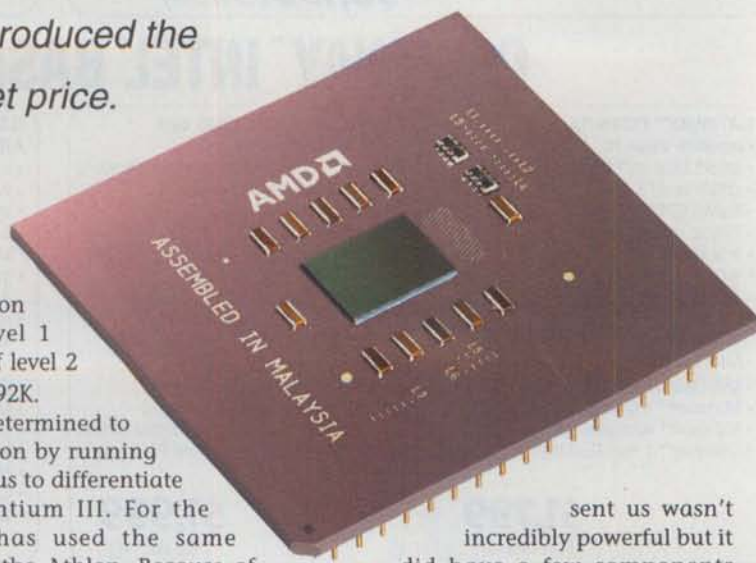
Duron is supposed to be competing with Intel's Celeron, which means it will be used in budget PCs, generally under \$2,000. The system AMD

sent us wasn't incredibly powerful but it did have a few components designed to get good benchmark scores. It wasn't a good example of a system that would use the Duron processor: the test system had 128M of memory, but most PCs under \$2,000 have only 64M. It had a 20G Seagate hard disk drive, whereas most budget PCs make do with an 8G to 10G drive.

Almost all Celeron-based PCs now use Intel's 810 chipset, which has integrated graphics and sound processors. The graphics and sound performance of the 810 chipset isn't all that impressive, but it reduces the overall cost of the system considerably, because separate graphics and soundcards are not required. Neither of the motherboard chipsets that support AMD's Duron or Athlon processors (VIA's KT 133 and AMD's 750) have integrated graphics or sound. SiS is expected to release an integrated Athlon chipset in the near future. The test system we looked at had an nVidia TNT2 Vanta display card with 8M of onboard memory, and a Gigabyte GA-72M motherboard using the VIA KT 133 chipset. This combination would be inexpensive, but not as cheap as a motherboard with an 810 chipset.

Cracks are showing

We were hoping to compare the 700MHz Duron system with a system that had



Intel's recently released 700MHz Celeron, but were unable to get hold of a 700MHz Celeron. Instead, we compared the Duron system with one of the budget PCs we tested last month (see *APC* August, page 84).

The systems were quite similar in configuration, except for the unusually large memory and hard drive on the Duron machine. The processor tests show the 700MHz Duron to be comparable to a 650MHz Athlon, which makes sense given the Athlon's larger cache memory. For business applications, the Duron machine demonstrated a signifi-

cant advantage in the Ziff-Davis Business Winstone 99 and Bapco SYSmark2000 tests. The Athlon-based system did better in 3D graphics, but even the Duron-based system scored a lot better than the Celeron-based PCs we reviewed last month, since the Celeron systems used the Intel 810 motherboard's onboard graphics.

We could not directly compare a Duron with a Celeron, but there are good reasons to believe Duron would prove the stronger performer. Duron runs on a faster bus (200MHz compared with 66MHz) and has more overall cache

memory. In addition, the Duron is based on AMD's K7 core, which has beaten Intel's aging P6 core many times in the Athlon-Pentium III battle. One possible limitation in the Athlon/Duron design is that its internal memory bandwidth is 64 bits, whereas the Pentium III/Celeron's internal bandwidth is 256 bits.

'How much?', you ask

AMD's prices for the Duron are \$US192 for the 700MHz, \$US154 for the 650MHz and \$US112 for the 600MHz, in quantities of 1,000. Intel's prices are very similar for Celeron processors with the same speed grades, although the 650 and 600MHz Durons are a little cheaper than equivalent Celerons. This makes sense at first glance, but what it really means is that Celeron-based systems will be a little cheaper than Duron systems, because there won't be the extra expense of graphics and soundcards. Despite this, it looks like AMD is going to pose a serious challenge to Intel in both the budget PC and performance PC markets. **mc**

Product	AMD Duron test system	Pioneer Computers Pioneer 2000 K7-650 (for comparison)
Contact	AMD	Pioneer
Phone	(02) 9959 1937	(02) 9690 2888
Online	www.amd.com	www.pioneercomputers.com.au
Price	Not for sale	\$1,500
Specifications		
Processor	700MHz AMD Duron	650MHz AMD Athlon
Secondary cache	64K	256K
RAM and type (maximum)	128M SDRAM (768M max)	64M SDRAM (768M max)
Hard disk	20G Seagate Ultra ATA/66	10G Seagate Ultra ATA/66
Hard disk controller	VIA Bus Master PCI IDE	AMD-756 Bus Master IDE
Hard disk file system	FAT32	FAT32
Graphics card	nVidia TNT2 Vanta	nVidia TNT2 64
Video bus type	AGP	AGP
Video RAM	8M	16M SDRAM
Video controller chip	nVidia TNT2	nVidia TNT2
Graphics driver name and version	NVDISP.DRV 4.12.01.0522	NVDISP.DRV 4.11.01.0208
Monitor	N/A	15in Diamond View
Tested resolution/colour depth/refresh rate	1,024 by 768/16 bit/85Hz	1,024 by 768/16 bit/85Hz
CD/DVD-ROM drive	40x CD-ROM drive	40x CD-ROM drive
Benchmark results		
Business Graphics WinMark 99	295	242
High-End Graphics WinMark 99	953	849
Business Disk WinMark 99	2,873	3,310
High-End Disk WinMark 99	7,853	11,000
CPUmark 99	59.9	58
FPU WinMark 99	3,820	3,557
Business Winstone 99	27.3	23.4
3DMark2000	1,361	2,096
Video2000	1,660	1,678
Expendable Timedemo (lowest fps)	18	30
Expendable Timedemo (average fps)	33	63
TreeMark simple (fps)	0.3	Not tested
TreeMark complex (fps)	0.2	Not tested
SYSmark2000	129	111

This month in First Take:

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SOUNDCARD

Videologic SonicFury 50

Gateway Solo 9300xl Deluxe



This is the fastest notebook computer that APC has tested; if any comment is likely to be recycled in the PC review business, it's that one. However, this is a genuine no-compromises machine that's sure to attract its share of admiration. Its specifications are higher than most PC owners have on their desktop systems.

The Gateway Solo 9300xl series (the top of Gateway's product line) could almost be described as portable multimedia workstations. Each one comes with a 6x DVD-ROM drive, a 15.7in display, composite video input/outputs, an S-Video connector and an IEEE 1394 interface.

The inclusion of this interface is a strong indication that Gateway doesn't want multimedia power users to overlook the Solo 9300xl Deluxe. IEEE 1394 is a standard specification for connecting digital devices together without the need for analog conversion. The presence of these interfaces in most popular brand digital video devices, Apple's iMacs (Apple FireWire), and nearly all of the new Sony VAIO product line suggests that competition for this segment of the market is increasing.

However, it will take more than a digital input port to corner the top end of the multimedia market. Once you have the data on board, you've got to be able to do something with it. This notebook's 750MHz CPU can handle intensive processing tasks; its 8M ATI Rage Mobility video controller should deliver an adequate display for video editing; and there's certainly enough storage space on its 18G hard disk drive for working with large data files. The unit's one weakness is its 15.7in screen; in average lighting conditions it's quite dim, and the quality of its display is highly sensitive to shifts in the viewing angle.

The Solo 9300xl has nudged the 700MHz IBM ThinkPad T20 off the performance pedestal it occupied last month (APC August, page 42). The Solo 9300xl outperformed the T20 in all but one of

APC's benchmark tests. It fell short of the T20 in the high-end business graphics tests by a hefty 21 points. This is odd, as the Solo 9300xl's video controller is not inferior to the T20's, and it outperformed it in every other video test.

If you care about your notebook's aesthetics, there's nothing either spectacularly beautiful or ugly about the Solo 9300xl's case. However, in order to include the 15.7in display, the whole unit has come out of Gateway's design department looking like something that might double as a helipad. Still, most users will be grateful for the extra surface area, as it allows the keyboard and trackpad to be positioned for more comfortable typing.

The Solo's drives are remarkably easy to swap, but there are few situations where you'd need to. The LS-120 drive can be swapped for an extra battery, which is a reasonably common requirement among notebook users. As it provides just over four hours of battery life, the Solo's battery run-down time is about two hours longer than the average sustained by other notebooks.

There is a cost for the convenience and performance offered by the Solo 9300xl, and you'll pay it in the form of sore shoulders. With a travelling weight of just under 4kg, this unit is heavy. It does have a dummy spacer for the LS-120 drive bay to reduce weight, but this is unlikely to make a noticeable difference.

At \$7,199 the Solo is not cheap, but the price isn't unreasonable for a machine with such a large screen.

Andrew Colley

Product	Gateway Solo 9300xl Deluxe
Contact	Gateway
Phone	1800 500 338
Online	www.gateway.com.au
Price	\$7,199
Warranty	1 year

Specifications

CPU	Intel Pentium III 750MHz SpeedStep
System RAM (M)	128M
Display adaptor	RAGE MOBILITY-P
Video controller chip	Mach64: Rage Mobility
Video RAM	8M
Video bus type	AGP
Display type	15.7in SXGA Active Matrix TFT LCD
Maximum internal resolution (64K colours)	1,280 by 1,024
Maximum external resolution (64K colours)	1,600 by 1,200
Pointer device	Touchpad
Sound adaptor	ESS Device Manager
Hard disk capacity	18G
Disk controller	Intel 82371 AB/EB PCI Bus Master IDE Controller
CD/DVD-ROM	TORISAN 6x DVD-ROM DRD-U624
Weight	4kg
Travel weight	4.4kg
Dimensions (h by w by d)	333 by 286 by 41mm
PC Card slot type	One Type III or two Type II
Expansion slots	2 USB, serial, parallel, PS/2, video in/out, audio in/out, IEEE 1394
Battery type	Lithium ion
Power management	ACPI 1.0 compliant
Network	Internal V.90 56K modem
OS available	Windows 98
Docking station available	Yes
Port replicator bar available	Yes
Carry case included	Yes

Benchmark Results

CPUmark 99	66.1
FPU WinMark	3,970
High-End Disk WinMark 99 (thousand bytes/sec)	10,130
Business Disk WinMark 99 (thousand bytes/sec)	3,120
Business Graphics WinMark 99	182
High-End Graphics WinMark 99	593
Business Winstone 99	28
Disk access time (milliseconds)	20
Battery Mark 3.0 (hours:minutes)	4:27 (max) 4:38 (battery optimised)
SYSmark2000	137
3DMark2000	671
Video2000 softDVD	
Quality	596
Performance	674
Features	545
Overall score	1,815

The products used in these tests are shipping versions available to the public at the time of publication unless otherwise stated. All specifications details are submitted by the vendor and APC accepts no responsibility for any errors within.

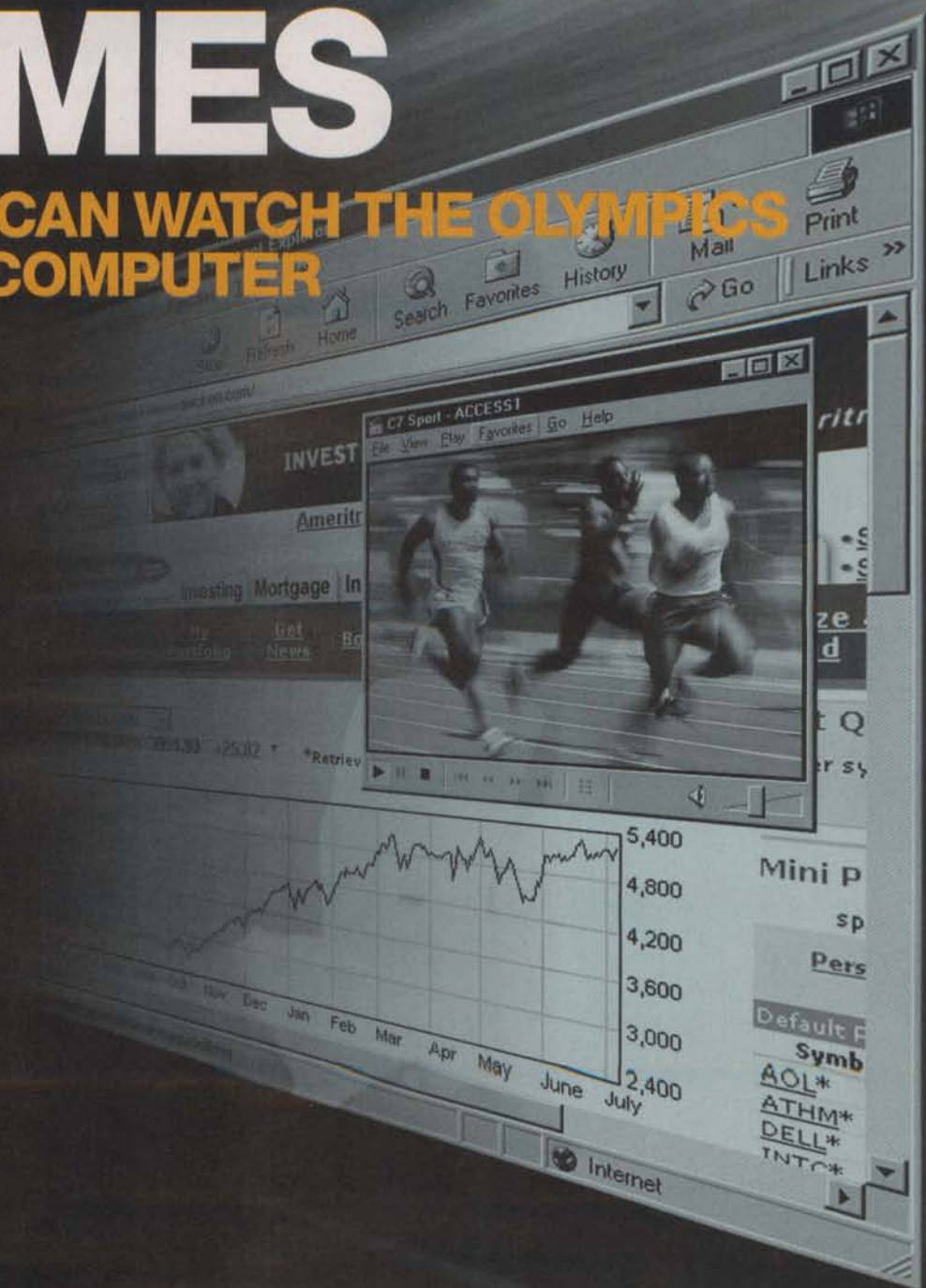
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To test the battery we had APM enabled on all notebooks. All power-saving features were disabled.

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Macromedia Dreamweaver UltraDev 1.0 and Generator 2 Enterprise Edition

Dreamweaver UltraDev is Macromedia's latest attempt to address the need for visual Web editing software that is server-aware. Macromedia's first effort was Drumbeat, which proved to be a very cumbersome and inflexible application service provider (ASP) development tool. Instead of re-engineering Drumbeat (arguably, a lost cause), Macromedia made an intelligent decision to add server functions to its hugely successful HTML editor, Dreamweaver.

Already in its third incarnation, Dreamweaver has been largely responsible for a lot of dynamic HTML (DHTML) and media-rich Web sites launched in the last year. It has opened up a range of client-side programming functions previously unavailable to designers, while maintaining a high level of code integrity to keep programmers happy. It also has an open plug-in architecture that allows a reasonable degree of customisation, at least compared to other editors.

UltraDev 1.0 is a complete version of Dreamweaver 3.0 with new server-orientated tools. First, there are 'server behaviours' which perform tasks like loops, data updates and dynamic listbox population. Then there are 'data bindings' which allow you to perform data queries, manipulate session and other server variables, as well as do things like populate form elements. However, the feature that really impressed APC was the Live Data view.

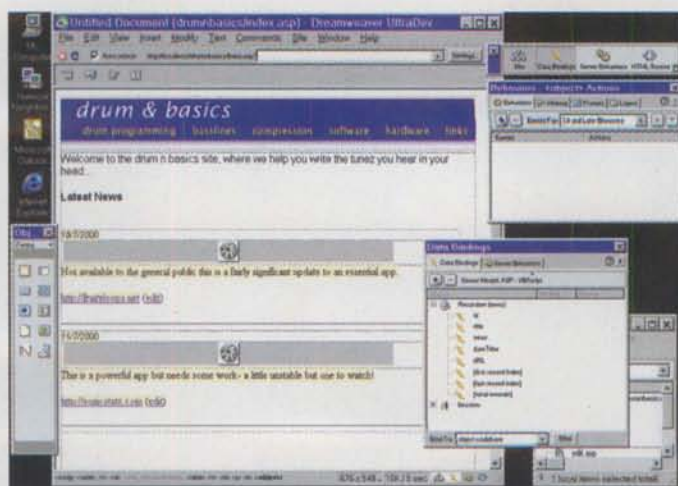
Essentially, this allows you to edit your page — be it ASP, Cold Fusion or JSP — in a visual environment. For example, you can set any necessary URL or form parameters in the live data setting box and UltraDev will request the page from the server and allow you to edit it as if it were a straight HTML page. At last someone has addressed the problem of Web development in a dynamic environment. This is a unique and awesome feature.

If you prefer to cut code in a text-based environment and are wary of programs whose central role is to automate programming tasks, you would be sceptical of UltraDev's claim to be able to manage database Web applications. However, APC was amazed at how straightforward it was to set up a few pages that displayed information from a database and then allowed us to edit it.

To populate a form with query data, all we had to do was drag and drop the fields from our query into form text boxes and UltraDev handled all the code transparently. The only problem we came across was updating date fields in Microsoft Access. This was surprising, because even though Access is a little temperamental about date formatting, there is an explicit data type in UltraDev for handling Microsoft Access date fields.

Once we had a few database-driven pages up and running we decided to try using Generator to create Flash movies with content we had sourced in UltraDev from our database. Generator comes in two flavours: the developer edition, which allows data to be drawn from other applications for the creation of Web content, and the enterprise edition, which performs these functions in real time. APC examined the enterprise edition, although you pay a premium for the scalability of the product and the support that Macromedia offers with it. The developer edition is \$1,995 per server, whereas the enterprise edition will set you back a cool \$55,000 or so, depending on your configuration.

The way Generator works is quite simple. First you create variables in Flash that you then pass as parameters from your HTML. UltraDev will prompt you for the information Generator requires and you can drag and drop your database query results straight into the Generator properties box in UltraDev. The trick is that in Flash, instead of exporting ordinary Flash movies, you need to export Generator template files. These are processed by the Generator engine on the server as they are requested, meaning that you can use animated and image-based content in places on your site that are ordinarily restricted to text. It's a designer's dream come true. Combined with UltraDev, it's a godsend.



If you've never found a visual Web editing tool any faster than hand coding, UltraDev is still worth a look. It's certainly an easy way to build a straightforward data-driven site from scratch. It's fast, intuitive and, with the aid of the live data function, allows you to code real time. Pages which need to perform multiple tasks or use If... Then... Else statements, especially those that output HTML, were messy to write in UltraDev, but that's not really what it's designed to do.

UltraDev seems to be aimed at existing Dreamweaver users who are familiar with its client side controls and site management, but want to start incorporating dynamic content. For this purpose, UltraDev is outstanding. For Web applications that use complex logic or custom server controls, or extend beyond simple data publishing, UltraDev barely competes with dedicated editors such as Allaire Cold Fusion Studio or Microsoft InterDev. Macromedia has come up with a reliable, standalone set of tools that make dynamic Web content more accessible to Web designers, and design tools more accessible to programmers.

Daniel Potts

Contact Macromedia
Phone (03) 9853 0900
Online www.macromedia.com
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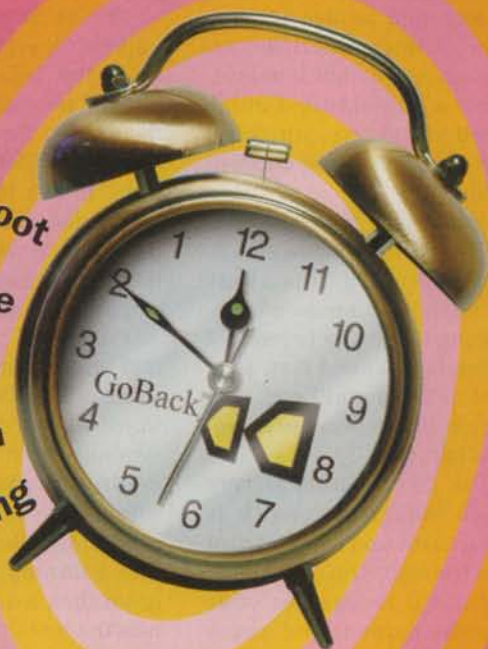
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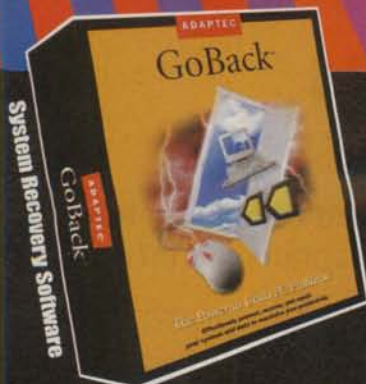
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Presto OCR Pro 4.0

Optical Character Recognition (OCR) software is one of those things that seems like a godsend in theory, but can end up more trouble than it's worth. The technology is designed to save time and effort by scanning printed text, so you don't have to retype it. However, unless the program is of a high standard, the large number of mistakes and incorrectly recognised characters can cause you to question its worth as an effective time-saving tool.

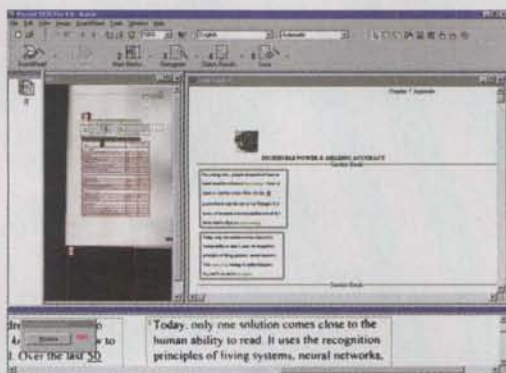
Presto has produced, it boasts, the most accurate OCR program available, with a 99.98% accuracy rate. Vast improvements have been made on version 3.0, including the ability to read 52 languages, recognise coloured text, save as PDF or direct to Word and Excel, and the option to train the software to recognise difficult characters.

Installation of the program is very simple and each step of the process is explained with a 'Scan and Read' wizard that guides you through. Once installed, Presto OCR Pro 4.0 recognises your TWAIN-compatible scanner and pages

are scanned directly to the program. The scanned page is then automatically divided into 'zones', from which an editable text version is produced.

The 99.98% accuracy claim is impressive, yet the results didn't live up to this bold statement when we put the program through its paces. Included in the manual is a page of sample text for setting up the software. In this trial alone, there were several failed attempts at fairly simple words. However, there is a correction option that allows you to single out suspect text and correct the errors.

Consistent scanning problems were: text with prominent pictures, any text from a less than perfect source copy (faint text, for example), or text with symbols or strange characters. In the event of the latter, you can 'train' the software to recognise difficult text by selecting a 'Read and Learn' checkbox and scanning sample pages. The program then learns to identify and recognise the text in question.



We can probably never expect perfection from OCR programs, but Presto OCR Pro 4.0 at least makes the process tolerable.

Fiona Williams

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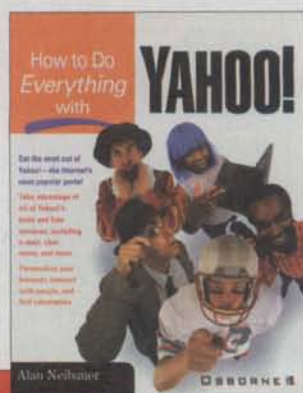
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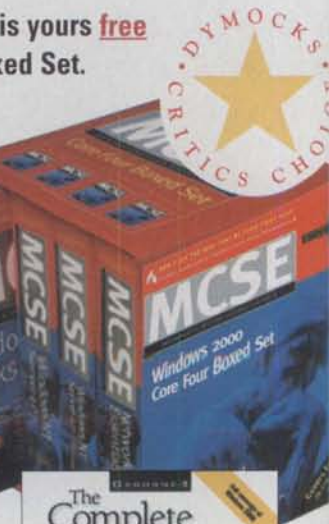
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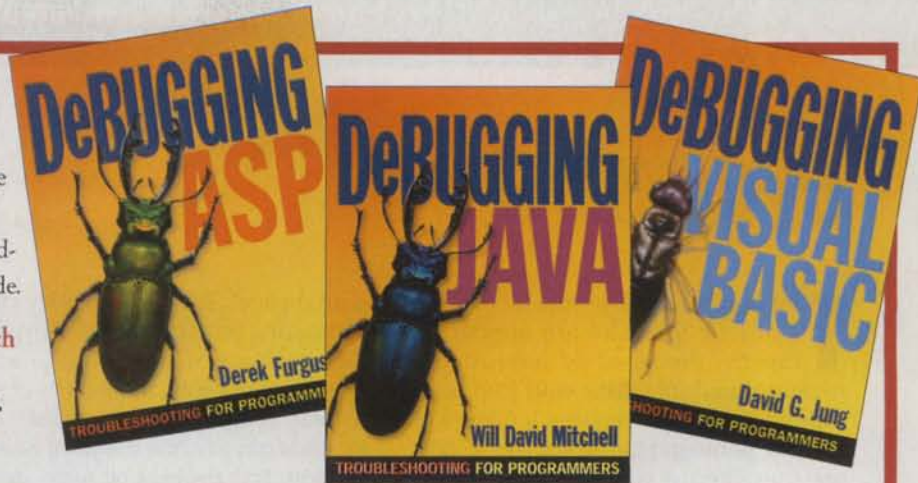
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eyeguard

The market for censorware is booming and new products are appearing rapidly, promoted by increasingly hysterical and moralistic calls to protect children from the corrupting influence of Internet pornography. APC is yet to find any truly effective censorware, whether it uses site-based or keyword-based blocking. Some programs block too much, most block far too little.

eyeguard takes an interesting approach to the problem. Rather than blocking Web sites or keywords, eyeguard analyses images onscreen, no matter which application they are displayed in. It works by detecting skin tones. If a certain percentage of the screen is taken up by skin-like colours, eyeguard assumes it's porn. You can adjust this percentage in eyeguard's

control panel. This is remarkably effective at detecting genuine pornography, though the occasional naughty image will slip through. Obviously, some types of pornographic images are not detected — latex fetishists can breathe a sigh of relief. The program isn't the least bit racist, detecting all skin tones with equal accuracy. However, it had a lot more trouble detecting monochrome images.

It is also remarkably effective at detecting things that aren't porn. Just about any picture of a human being has the potential to trigger eyeguard. Images such as the splash screen for a popular image editor (see figure 1), a head shot in a news article or a baby photo (see figure 2) received eyeguard's kiss of death. By adjusting eyeguard's sensitivity, it's possible to reduce the number of false alarms, but this creates more room for genuine porn to go undetected.

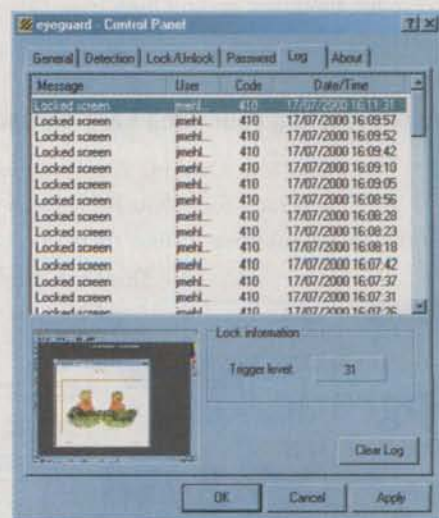
Despite claims of sophisticated algorithms for image analysis, there's nothing terribly clever about eyeguard. To test it out, we tried eyeguard on a skin-toned background. No problem. Then we tried a skin-coloured gradient (see figure 3). The alarm bells started ringing. When we reduced the size of the skin-coloured box, the image was allowed through.

The package can work in one of four ways when it's set off: it can lock the computer completely until it's unlocked by a supervisor; it can give the user a number of warnings (the number can be set by the supervisor) before locking the computer; it can run in the background with an icon in the system tray; or it can run in the background with no warning. In all these cases, any time a suspect image is detected, eyeguard logs the event and takes a screenshot.

The designers of eyeguard have gone to a lot of trouble to make the program hard to circumvent. It doesn't show up in the task manager when Ctrl-Alt-Del is pressed, or even in the Windows NT processes list. Even those clever enough to hack the registry would have trouble working it out. However, it's extremely obvious the program is running, even in 'stealth' mode, because the mouse pointer constantly flickers and the screen flashes occasionally.

Standalone and corporate versions of eyeguard are available. These are almost identical, except that the corporate version sends all the logging information to a central server.

The real value of eyeguard is as a deterrent. Employees or children are



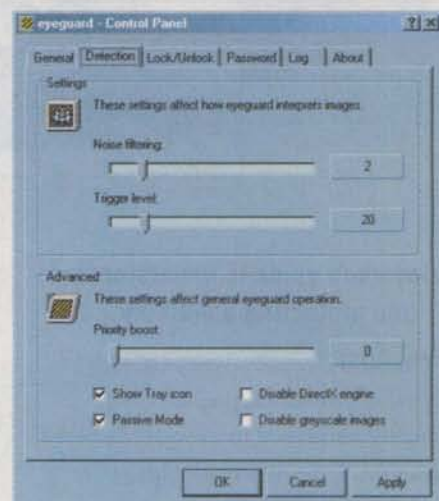
▲ Figure 1



▲ Figure 2



▲ Figure 3



much less likely to abuse their email or Internet access if they know it's being monitored. Of course, eyeguard only blocks pornographic images and videos — there are all sorts of other nasties and time-wasting resources it does nothing to address. Also, its over-zealous censoring and lack of intelligence will cause frustration for both users and supervisors.

By the time you read this, version 2.0 should be available. This promises a more sophisticated level of control over which images aren't acceptable.

Josh Mehlman

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Quantum Snap Server

Turnkey server solutions seem to be all the rage right now. Numerous PC vendors have launched devices that are hard-wired to perform a specific set of common functions such as file and print serving, email serving and Web serving. They're almost universally managed through a set of simple options in a Web browser. An example of such a device is the Gateway Microserver (see *APC* April, page 44).

Quantum's Snap Server only does one thing, but it does it very well. It's a file server. It also does Web serving, but only in a very limited fashion.

As a file server, it's top notch. You simply plug the server into the network and off it goes. There are some considerations to take into account, such as static or DHCP-assigned IP addresses, but the Snap Server handles both with equanimity. We were amazed at how well it worked on our sometimes perilous local DHCP network: it picked up the IP address, gateway and even WINS address without any hassle.

A black box with two plugs — Fast Ethernet and power — the Snap Server is designed to be rack-mounted or stacked. For those on a DHCP, BOOTP or RARP network, installing the Snap Server is particularly easy. Plug it in and all you need is a Web browser to administer it. If you're on a static IP network, an application needs to be installed on a Windows or Mac system that initially configures to the server, but once it has its IP address, the server can be fully managed using a Web browser.

The Snap Server can masquerade as a Windows (SMB), AppleTalk 6.0, Novell (IPX) or Unix (NFS) server. The configuration is quite cleverly implemented on each count, even including support for common Windows, Netware and Mac OS backup systems. Alternatively, clients can draw files from the server via a Web browser. The Snap Server lists files on its disks FTP-style (although it uses HTTP), and you can click



on a link to download a file. Uploading is not possible using this method.

A simple Web server can be set up by dumping HTML and associated files into a directory. Whenever someone hits on a directory from a Web browser, the Snap Server checks for the presence of an index.htm file. If it's there, it sends that page to the Web browser using HTTP 1.0. This is Web serving at its most basic — ISAPI filters are out of the question, for instance — but it should be enough for most needs.

The administration console allows you to configure the disk arrangement and check or format the disks in the server. It's possible to set up the Snap Server's disks as individual volumes or as various kinds of RAID arrays. The default on the server APC looked at was RAID 5, which sets the disks up as one large data protection disk. Striped (RAID 0) and mirrored (RAID 1) arrays are also supported. Support for RAID 1 and 5, in particular, provide data protection that you won't find in many other solutions.

Its security model is similar to user-level security on Windows NT systems. Administrators set up volumes and give individual users or groups access to those volumes. Access levels can vary between read, write and full access. Alternatively, the Snap Server can apply an NT or Netware domain's security policies to directories. Administrators can also view live file usage through the Web administration console, and the Snap Server produces a log file listing all accesses to shares on the server. The administrator can check on disk status in the administration console, and the Snap Server can be configured to send out an email notification should there be a disk failure.

If there's a weakness in the Snap Server, it's that it is too simple. Volume sizing in particular is impossible, so setting up personal directories with size limits is also almost impossible. One solution is to make the Snap Server only accessible to a server with some kind of directory service,

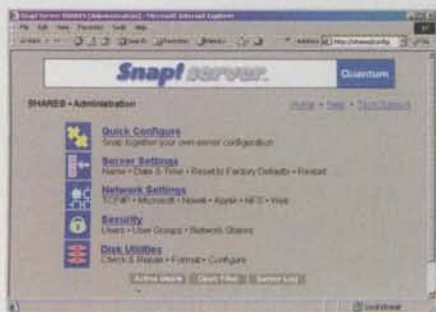
but then you don't use the inbuilt file serving capabilities of the Snap. You might as well attach an external fibre channel or SCSI disk array to the server, which would provide better performance than Ethernet.

It's difficult to gauge the performance of the Snap Server — so much of it is dependent upon network performance. It uses Quantum EIDE disks exclusively (although if you cracked it open you could probably insert other brands of hard disk). It's based entirely on a custom processor and an embedded OS. The latter is flash-upgradable: Quantum releases updates from time to time to support new protocols and backup systems.

The Snap Server comes in a variety of configurations, the main variable being storage capacity. APC looked at the Snap Server 4000, which has 120G of storage capacity on four drives (only 84G in the default RAID 5 configuration). Alternatively, the Snap Server 1000 has a single 15G or 30G drive, and the Snap Server 2000 has 60G on two drives. The 4000 is the only one that supports RAID 5, although the 2000 supports RAID 0 and 1. With only a single drive, the Snap Server 1000 does not support RAID.

All this does not come cheap. The device APC looked at costs \$6,541. However, setting up a decent file server with a 120G RAID array, Windows NT Server and all the associated peripherals would cost considerably more — and that's on top of the time and money needed to configure and manage the PC.

Nathan Taylor



▲ The Snap Administration Console

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Minolta. First to put you first.

Norton Personal Firewall

Firewalling applications are reasonably simple pieces of software. They monitor your system's network ports and filter incoming and outgoing traffic based on a set of rules. The only way that a firewall application can distinguish itself from its peers is by making firewalling technology accessible to the average user.

The broken promise of user-friendly firewalling could send a lot of software developers off to hell on Judgment Day. Peter Norton and the Symantec crew may also face a few anxious moments at the Pearly Gates for the same sin.

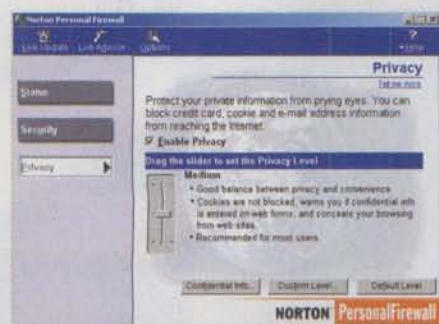
Personal Firewall does reduce the technical overhead associated with using a firewall (you don't need to be a network

architect to use the software), but like Symantec's antivirus products, it relies on Symantec's research services. Just as virus definition files allow antivirus software to detect viruses or virus-like behaviour, Personal Firewall's definition files allow it to distinguish between innocent port activity — the kind attributed to common Internet applications — and that associated with malicious attacks and infiltration.

In medium security mode, this program will refer to its definitions to update its firewall rules automatically as it encounters known behaviour. Only in high security mode is all traffic blocked, forcing the user to decide how to handle it. This is a great system, but it has some failings.

Even in its automated security modes, there are times when the software calls on the user for a judgement, and the information presented to the average user about the port traffic will probably be too difficult to understand.

If you want Norton Personal Firewall to remain simple to use, you have to pay an annual subscription fee for continued



access to its definition files. There are a number of shareware applications that you can buy online for as little as \$US40 that are as functionally powerful as a commercial product like Norton Personal Firewall (which costs \$108 in Australia).

Another downside to the automated system is that Personal Firewall's rule setting wizard makes it easy to block too much traffic inadvertently. When more precision is necessary, you need to learn the very things you've paid a premium price to avoid.

Andrew Colley

Contact Symantec

Phone (02) 9850 1000

Online www.symantec.com

Price \$108

In short Personal Firewall takes some of the mystery out of firewalls — at a steep price.

VideoLogic SonicFury

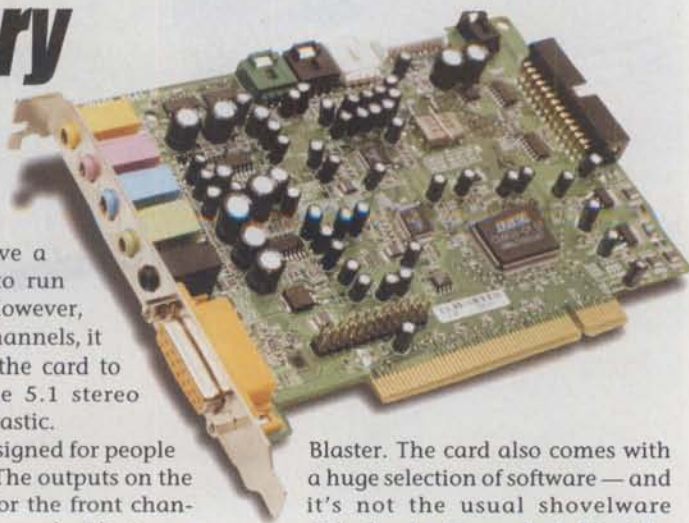
By far the most high-end soundcard APC has listened to, the new SonicFury card from VideoLogic and Turtle Beach has more features than our subwoofer and satellite speaker system could handle — and ours is a decent system. Instead, we used the Sirocco Crossfire four-speaker and subwoofer speaker set, also from Syslink (\$995), but even this wasn't able to give us the full effect from the soundcard.

Two features distinguish the SonicFury from its competitors: its low price and six channels. The card is based on the Crystal SoundFusion DSP (digital sound processing) chip. You can run the card as stereo, four channel or six channel, depending on your speaker setup.

We were unable to get the fifth and sixth channels up and running as we didn't have a suitable speaker set to run the audio through. However, played through four channels, it was clear that using the card to play a DVD with the 5.1 stereo enabled would be fantastic.

The SonicFury is designed for people after excellent audio. The outputs on the back of the card are for the front channel, rear channel, channels 5/6 (versa jack), line in and microphone. The versa jack can be used for PCM (48KHz), digital 5.1 streaming for DVD or for headphones — use is toggled via software. The card has two effects processors, so with the right speaker setup, you can control positional effects and emphasis over all the channels.

It's compatible with most audio standards, including DirectSound and DirectSound3D, EAX, Aureal A3D 1.0 and everyone's favourite — Sound



Blaster. The card also comes with a huge selection of software — and it's not the usual shovelware dished out with products like this.

Full versions of Yamaha Softsynthesizer XG and Studio XG (these emulate the Yamaha XG hardware) as well as Voyetra Digital Orchestrator and Sonic Foundry's ACID Xpress are included.

For the average home user buying a budget system, a cheaper card might suffice. However, budding audiophiles who want excellent PC audio won't go wrong with the SonicFury. At \$275, and with a five-year warranty, this card is a steal.

Darren Ellis

Contact Syslink

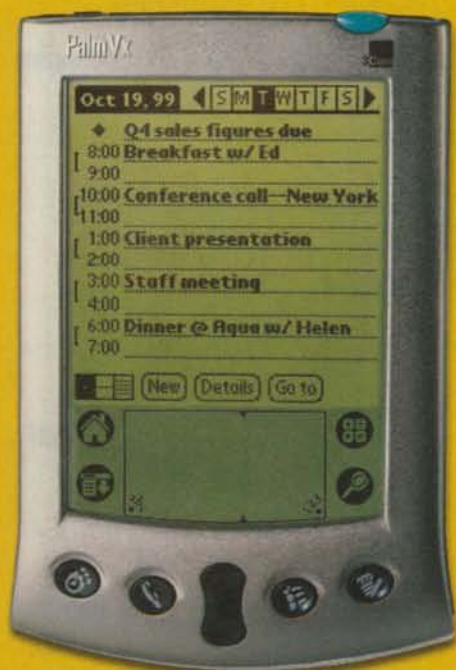
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With 17" Monitor **\$2615**

APTIVA 32A CEL600 64/15 CDRW 56 15" MONITOR **\$1800**
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Having a Wine

In your July issue, you noted that an article on running Windows apps under Wine would be in the next issue. The implication was that you would be providing real information on installing, configuring and running Windows apps on a Linux box. I do not consider a review of three products to be an 'article'.

On a different note, it's good to see that APC has returned to providing good information on IT topics and related issues over the last 24 months. In the mid-90s APC lost the plot and published mostly product reviews. I would scan the magazine on the newsstand, then replace it. Now I'm subscribing, and finding new information every month. Such a shame to be let down on the Windows apps on Linux matter.

By the way, I still have quite a few articles from your '80s mags in my reference files. The hardware may change, but quality reference material and articles do not have a use-by date.

Name withheld
Internet

Need more Bill

We have an ardent Microsoft supporter (yes, they exist) currently contracting in our office, so I was delighted to put up the Bill Gates cream pie poster in my work area to annoy him. Soon afterwards weird things started happening to the work I was doing in Excel. For no good reason, numbers like -9.58....E132 appeared randomly in cells. Then the file became corrupted and crashed Excel when I tried to reopen it. Luckily, my other machine at

work runs Linux and StarOffice, and the day was saved. In the upcoming weeks, could you please supply a BG dartboard cover and BG inflatable punching bag? You would be helping to make Australian workplaces and homes happier and more harmonious places.

Andrew Wright
Internet

Poor tasting pie

I feel your use of the Gates pie-in-the-face poster was in poor taste.

I realise that Bill Gates may not be a favourite person for many readers. However, I would rather see him criticised with rational argument than ridicule.

Michael Rychter
Dover Heights, NSW

Ed note: Not since the 'Calling the tune' incident have we seen such controversy. The two letters above are examples of the extensive feedback we have received about the poster in our August issue, and none of it even mentions the Windows shortcuts. We just thought it was funny (and couldn't think of anything else to put on the reverse side of the poster). Speaking of 'Calling the tune', the debate rages on...

Out of key

I was surprised to see Angus Kidman write with such authority on the subject of IT-related music. One would expect such strong comments to be supported by good research. In addition to the songs mentioned, I am able to think of four others. There is Peter Combes' 'Syntax Error' (albeit a tad outdated), "Weird Al" Yankovic's 'It's All About the Pentiums'

and 'Windows 95 Sucks', and of course Eiffel 65's 'My Console', which, as consoles become more PC-like, certainly fits the bill. The apparent lack of IT-related music is hardly a pertinent issue for computer users.

L Boland
Katanning, WA

Ed note: Again, we thought the issue was kind of funny. This reader's final comment struck us as particularly ironic, but he was not the only one to say, 'I don't think this topic is relevant to computer users, I don't know why you wrote about this nonsense, and here are some other songs I thought of...'. Of course, the volume of reader feedback we receive on these topics pales in comparison to that on the following topic...

Of course, the volume of reader feedback we receive on these topics pales in comparison to that on the following topic...

Sticky situation

I just bought the August issue of APC a few moments ago and have again managed to tear the front cover because of your absolutely excessive use of glue strips on the CD. I went at the task very slowly, but to no avail.

There has to be another way of affixing the CD without destroying the cover.

Colin Johnson
Internet

Ed note: The glue leaves us in a damned-if-you-do, damned-if-you-don't situation. If the glue is too weak, the CD falls off, and the magazine doesn't sell. The glue has to be of a certain strength to hold the weight of a jewel case and two or three CDs, and usually this is too strong to detach from the cover readily. For avid collectors, there are metho-related solutions, but probably the best way around the problem is to subscribe. Subscribers now receive their CD and magazine sans glue.



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Australia's bizarre digital TV regulations are on a collision course with commercial reality.



Angus Kidman

Angus Kidman is editor in chief of APC and Newswire. He can be contacted at akidman@acptech.net. Angus' DisGust column is published Tuesday to Thursday every week at newswire.com.au/disgust.

The Levitical law

One of the wackiest books of the Bible is Leviticus. Many Christians choose to downplay this Old Testament legal encyclopedia, and understandably so. Selling the virtues of the life of Jesus is a much easier task than explaining a set of bizarre rules that allow you to exchange one lamb for two pigeons if you find yourself short of resources before the next ritual sacrifice.

I can't help thinking that the Internet industry is going to exhibit a similar response to the Broadcasting Services Amendment (Digital Television and Datacasting) Bill, passed by the Senate after a surreal and marathon debate in June. The digital television provisions, which lock down the way in which the main broadcasters can offer services using the new spectrum, are questionable enough. But the really dubious elements are the provisions which are designed to ensure that no-one who bids on the extra DTV spectrum available and uses it for a Net-style service (a process the government has for some reason branded 'datacasting') can compete with the existing commercial TV broadcasters.

The debate over datacasting was based on the idea that datacasters shouldn't be allowed to compete with broadcasters, because they have to invest substantial amounts of money in digital TV conversion. As a result, the Senate debate focused on irrelevant issues such as whether datacast news summaries must have a presenter, but never questioned the notion of trying to regulate spectrum use just to protect existing businesses. Greens Senator Bob Brown appeared to be the only person in Parliament willing to ask whether the process was built on a flawed premise.

Whether you think this is because the political parties involved are scared of the

electoral damage a hostile TV network could inflict depends on your degree of cynicism. A weakness in this argument lies in the fact that the provisions haven't been applied consistently. Streaming media technologies allow anyone who offers Net access to provide a fair facsimile of broadcast services anyway. Datacasters are permitted to broadcast Internet material, and there's no shortage of streaming content

out there these days. Television broadcasters have not been protected from this. So where exactly is the line between datacasters and broadcasters going to be drawn? What are they going to do, filter every site that passes through a datacaster? Even the current government probably isn't dumb enough to pursue that argument twice, having been burnt by our ridiculous censorship laws.

The only saving grace the legislation has is that it is so out of touch with reality that it's unlikely to have much impact. Digital TV is by no means guaranteed to

What would you rather have in your house: a digital television which allows limited Web surfing from an inconvenient onscreen keyboard, or a high-speed line that offers you a whole range of largely unrestricted services?

succeed, especially if Telstra and its competitors meet their ambitious schedules for rolling out ADSL and other high-bandwidth services. What would you rather have in your house: a digital television which allows limited Web surfing from an inconvenient onscreen keyboard, or a high-speed line that offers you a whole range of largely unrestricted services? (Many APC readers may want both, but few would be willing to sacrifice the latter for the former.)

By the time Senator Alston and his cronies notice this, I suspect that the entire datacasting argument will look quite hollow, and there'll be a frantic scramble to find some other way to protect existing television monopolies. At that point, though, substituting two pigeons for one lamb may not be such an easy task after all. ■



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Paper is a great medium, but we need to get paper and electronic material to work together.



Jeremy Horey

Jeremy Horey is a senior consultant with Com Tech Online.

He can be contacted at

jhorey@comtech.com.au.

Wrap it up

Despite the best efforts of the IT industry, paper is as much in demand as ever. It's no secret that the dream of the paperless office has died. In the last 25 years the amount of paper consumed by office workers has doubled. While newspapers publish online editions, their paper versions continue to sell as well as ever. Many people have predicted the end of the paper book, but digital books remain curiosities.

There is something about paper that makes it too useful to do without. In fact, paper is such a simple medium that it's easy to underestimate its power.

Just printing a document can have a profound effect on how that document is seen. John Seely Brown, writing in *The Social Life of Information*, explains it this way: "Microsoft executives have confronted problems of translation as digital email messages have [been] entered as paper evidence

in the antitrust suit against the company. When electronic messages are turned into paper ones, whispers can turn into broadcasts. The informality of a hint or a guess suddenly looks like a firm decision [when] cast in ink."

Paper is also good at providing context. A printed newspaper presents news very differently from an online version. The quality of the actual paper is the first indicator of the context. The better the paper feels, the more 'quality' we expect from the content. Also, we expect different news from a tabloid than from a broadsheet.

Then there is the position of the story in the paper. Is it front page or on page 22? Is it at the top of the page? Does it come with a picture? How big is the headline? How much of a fuss is made about the author? Does the author's picture appear with their byline? The answers to these questions tell you a lot about the story.

This context is lost in the online version. There are no restrictions on the size of the

edition and the stories are not organised into hierarchies of importance. There may be a distinction between front-page stories and the rest, but this organisation is much looser than that of a paper version.

Newspapers are just one example of the difference between paper documents and electronic documents. There is a dramatic difference between a tender response delivered by email and one printed and bound. The bound version carries more weight than the electronic copy. Somehow it has more authority.

The paradox is that the printed version is harder to work with. It's harder to keep track of where it is. It's harder to copy and harder to circulate. It's also harder to modify.

As we work with paper documents, we add context to these documents. We make notes in the margins and add Post-it notes. We circle or highlight

pieces of the text, and cross-reference the documents. For all sorts of reasons, it's easier to do this on paper than electronically.

Today's online newspaper is not as useful to me as the paper version. With the paper version I get all the context, as well as the ability to read that paper almost anywhere and in almost any order. But electronic versions are also useful.

If I'm looking for an article about a specific subject, or articles that merely mention that subject, paper archives are a terrible place to start. They involve time-consuming manual searches through stacks of newsprint. Unless I'm desperate, I find some other way to collect the information I need. In this case, an electronic version of the newspaper archive is invaluable.

Although we might dream of the day when paper is consigned to the dustbin of history, it is not going to go away. Paper and electronic documents both have their uses. The challenge is to design systems so that we can get the best from both. ■

There is something about paper that makes it too useful to do without. Paper is such a simple medium that it's easy to underestimate its power.

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Personal
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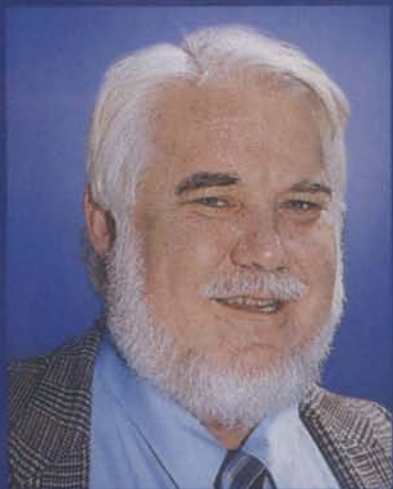
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*Who will really benefit from spectrum auctions?
Can spectrum possibly be worth that much?*



Stewart Fist

Stewart Fist is Australia's leading telecommunications commentator.

Selling off spectrum

Economists will tell you that auctions are the only way to establish the true value of a product or service.

With spectrum auctions, only the richest of the rich can win, and incumbent carriers are clearly in the box seat.

After all, if you are making lots of money in the current voice-based mobile phone business, then \$30 million spent at spectrum auctions to maintain your position is not all that significant. There is plenty of evidence that existing carriers often bid only to keep new competitors out. Even if they don't win, they drive up the entry price and make it difficult for others to succeed.

New entrants face an uphill battle with high initial costs and low income for many years. Only big foreign telecommunications companies, or Australian media companies, usually have the resources to cover these sustained losses.

When third-generation (3G) mobile spectrum is released by the government, existing players may bid just to defend their business (and protect their heavy financial investment). This adds to future costs, pads out the government's pork barrels, and effectively becomes a tax on telecommunications.

In 1998, the Australian government raised \$347 million by selling 45MHz of spectrum to the three existing operators: Telstra, Optus and Vodafone. Then, in March this year, it flogged off 30MHz of spectrum in the 1.8GHz band in the five mainland capitals, and raised another \$1.32 billion.

This was lower than the analysts expected because the three existing carriers were prohibited from bidding. Even so,

Hong Kong's Hutchison bid \$679 million, and the Packer/Murdoch-owned One.Tel bid \$525 million.

According to PricewaterhouseCoopers communications consultant Geoff Fietz, this price surge reflects competition in the deregulating Australian telecommunications market. He believes that it is also a reflection of the effectiveness of new technology, which allows for greater use of the spectrum.

Recently, five new 3G mobile operators

Recently, five new 3G mobile operators in Britain paid the equivalent of \$US1,000 per capita at the UK spectrum auction.

To build five networks, they say they will now spend, on average, about \$US28 billion each.

in Britain paid the equivalent of \$US1,000 per capita at the UK spectrum auction. To build five networks, they say they will now spend, on average, about \$US28 billion each.

These total costs translate into something like \$4,000 to \$6,000 per person in Australia, and if only 12% of us need packet-data 3G networks, future customers will carry the burden of

about \$30,000 to \$50,000 each in capital debt. This doesn't include normal operating and interconnection costs.

By my rough calculations, it's impossible for the new 3G carriers to cut costs below \$3,000 to \$4,000 per year for the average customer, which is why I don't see 3G as a large market.

This new 3G business is supposedly being driven by the introduction of mass-market location-based services, driver-navigation, and point-of-sale authentication applications.

My guess is that the potential take-up of wireless wideband data is going to be much, much lower than the enthusiasts predict — especially if we have WAP-based data devices with rates in the order of 14.4Kbps already available on existing cellular networks. ■

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*There's more to the humble beige box
than meets the eye.*

Case studies

Overclockers excepted, people rarely engage in heated debate over the humble computer case. Home system builders tend to assume that one case is as good as the next, so they'll often choose the cheapest. Only later, after experiencing repeated untraceable system crashes or inexplicably poor performance, do they discover that the case has let the system down.

Case prices range from about \$50 for a basic ATX minitower to as high as \$1,000 for a deluxe server case that can comfortably accommodate a multiprocessor motherboard and a fleet of high-performance hard drives. A basic ATX case, costing somewhere between \$60 and \$100, is adequate for a standard hardware configuration (consisting of one hard drive, one motherboard, one CPU, a standard set of PC cards and one of each of the three drives that are commonly built into most modern systems).

However, if you know that your system is going to draw a lot of power running a dual CPU motherboard or powering a heavy combination of hard drives, CD-

ROM drives or CD burners, it's worth spending a little more. You need to do more than simple accounting tasks like matching drive numbers to drive bays or your motherboard's width to the dimensions of the case. Make sure that your case can supply enough power to stop all of your components from under-performing.

Also check that they're not so densely clustered that your computer becomes too hot, destabilising the operation of your components.

Most cases that are designed for demanding scenarios like this have a powerful built-in ventilation fan, about four 5.25in drive bays, room for between four and six 3.5in hard drives and a 300-watt power supply unit. Provided you don't choose one of the newer iMac-coloured deluxe cases, these additional specifications should only add between \$60 and \$100 to the price of a standard ATX desktop tower.

Once you've identified the kind of case that'll meet your technical needs, you can take into account secondary considerations such as accessibility and perhaps even aesthetics.

The importance of accessibility shouldn't be underestimated. If you're buying a PC case, you're probably



About Price Watch

Each month, Price Watch examines variations in retail pricing and service. Investigations are conducted anonymously, either by telephone contact with retailers or through pricing details supplied on their Web sites. Prices and specifications provided here are as quoted by retailers; while we assume these are correct, we cannot accept responsibility for errors or omissions.

the kind of person who will be making additions and improvements throughout the life of the system. Constantly snaking your fingers into treacherously narrow gaps between sensitive electrical components and the sharp metal edges of a drive bay power supply chassis becomes a pain — often literally.

Choosing a larger case will eliminate most of these problems. However, there are a few deluxe PC cases around that mimic the innovative design of the Apple iMac and G3 towers. The motherboard sits on a hinged panel which opens away from the rest of the case, giving easy access to the interior. Unfortunately, if you want to buy one you'll probably have to purchase it online from a US vendor (such as Nikao at www.nikao.net). At the time of writing, few Australian retailers seem willing to import these cases for retail.

Retailer	Contact	Model	Power supply	Price
Australian Computer Recyclers (Melbourne)	1300 883 311 www.pcrecyclers.net	ATX miditower	250W	\$97.90
		ATX minitower	250W	\$60.50
EYO Technologies	(02) 9755 4888 www.eyo.com.au	AOpen HC45 miditower ATX	250W	\$97.35
		AOpen HX08 full tower ATX	300W	\$186.56
		AOpen HX48 miditower ATX	300W	\$137.94
		Macase K10 Sunrise miditower	400W	\$155.32
Forté	1300 368 923 www.fortecomputers.com.au	Deluxe miditower ATX	250W	\$59
		Deluxe desktop ATX	250W	\$59
		AOpen HX08 full tower ATX	300W	\$206
		Intel Columbus III server chassis	300W	\$573

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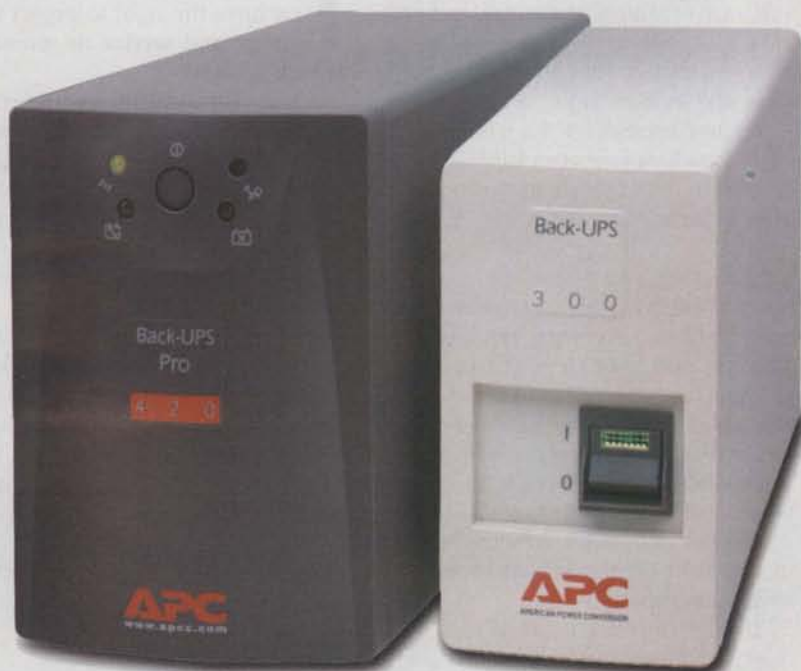
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Your Letters

Write to Your Letters and tell us about your shopping experiences.

Whether you want to vent frustration or relate a positive encounter, this is your opportunity to share it with other APC readers. The contact details are on the opposite page.

If your complaint letter is published, let us know how your complaint progresses. We'll publish updates on as many of these letters as possible.



Dear APC,

I read your recent article on different ISPs and found it very interesting. However, I didn't see a test result for dingo blue.

I have tried seven ISPs and those who were any good were too expensive. NetConnect Communications was the best of these, costing \$1 a hour if bought in 200-hour blocks.

I noticed a newspaper advertisement for dingo blue offering unlimited hours for \$25 a month.

To qualify for this price, I had to change my long-distance phone account to dingo blue, which is owned by Optus.

Well, I couldn't be happier. Its support is fantastic, and its staff are always willing to help. I never get kicked off and its speed is right up there with the best dialup ISPs.

If you sign up another person via its Web site, both you and the person you sign up receive \$40 in credit on your dingo blue account.

Graham Howard
Wendouree, Vic



Dear APC,

I'm upgrading my system to Windows 2000 but can't find a new driver for the Diamond Viper 32M V770 video card I bought recently.

Representatives of Diamond referred me to the nVidia site, but said that they could not guarantee the card would work anyway.

These cards are still selling today, but Diamond representatives told me it has no intention of supplying drivers for Windows 2000.

I want to warn others not to buy these cards before ensuring that they are compatible with Windows 2000.

John Morrow
Richmond, Vic

Going cheap

If you spend \$800 on a computer, do you have the right to expect the same quality and service as someone who spends \$3,000?

Of course a machine with better specifications will be faster, perform better and may last longer. A computer that has been put together with budget components won't necessarily last as long as one built from top-of-the-line parts.

However, your consumer rights don't change. The goods must be of merchantable quality. In the case of a computer, this means that it must work. If it doesn't, you are as entitled to a refund, replacement or repair as someone who's bought a more expensive model. You have the same right to complain, even if your purchase was inexpensive.

APC received the following letter from one of our readers.

Dear APC,

In November, I purchased an eMachine eTower Celeron 300 computer (minus the monitor) from Dick Smith Electronics in Geelong for \$799.

In March, the A: drive began having intermittent problems reading floppy disks. I returned the machine to the shop on March

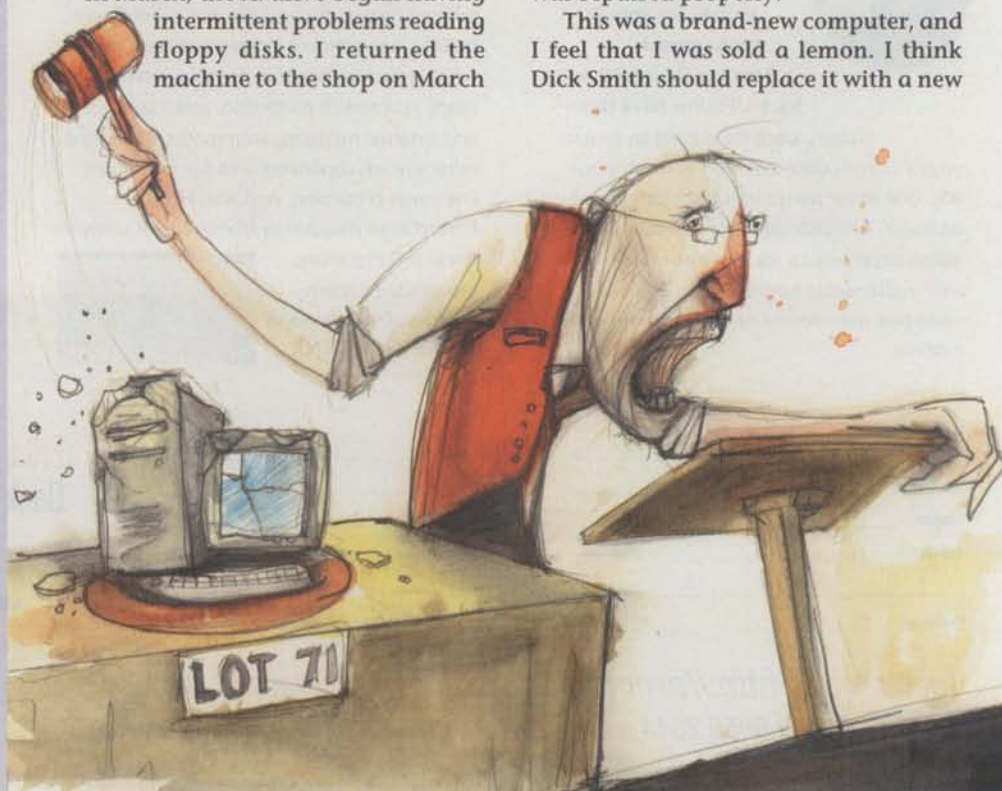
8 and was told it would have to be sent to the warranty company, Creative Pacific, in Sydney.

A week later, I called to find out what was happening and was told that it could be up to six more weeks before I would get my computer back.

I complained about this excessive wait, explaining that I had just paid in advance for a three-month Internet connection and that half of this would be gone by the time my computer was returned. It came back on March 30. The CPU and fan had been replaced, but the problems persisted.

In May, other problems became evident. The machine would not respond to the Ctrl-Alt-Del command; instead, it crashed completely. Freezing became more regular until a serious disk error reading to the C: drive occurred. Again, I returned the computer to Dick Smith. The next day, they called to say the computer was fine. It worked without any problems for a few days before it began playing up and I returned it to the shop again. This time, I asked that the computer not be returned unless it was repaired properly.

This was a brand-new computer, and I feel that I was sold a lemon. I think Dick Smith should replace it with a new



Whether you buy the cheapest PC in the shop or the most expensive, your consumer rights are the same.

one, or at least extend the warranty for a further 12 months. I've had more problems with this computer in seven months than with any I have owned in the last 25 years, and that includes my Commodore 64.

Anne Daglish
Bell Park, Vic

APC's Service & Reliability forwarded this letter to Dick Smith Electronics, requesting a written response within seven days.

A few days later, Anne Daglish contacted Service & Reliability to say she had received a surprise phone call from a Dick Smith representative who gave her three options: an upgrade to a faster machine for an extra \$150, a repair to the original machine, or a refund.

Daglish told Dick Smith she couldn't afford the \$150 upgrade, and that after her unsuccessful attempts to have the machine fixed under warranty, she did not want to keep the original machine. The refund seemed the obvious choice, but she could not afford to buy a more expensive PC.

While she was weighing up her options, the Dick Smith representative called her again later in the day to offer the upgraded computer at no additional cost. As Anne was assured the upgraded machine would be brand-new, and as she would not be out of pocket, she accepted the offer.

APC then received the following letter from Dick Smith Electronics:

Dear APC,

Thank you for giving us the opportunity to respond to the letter you received from our customer, Anne Daglish.

The letter brought the problem to the attention of our Geelong area manager who, up until seeing the letter, was unaware of the matter. As a result of his investigation with our service department and the Geelong shop, he decided that the fairest response was to replace the faulty product.

He has since been in contact with Ms Daglish and she is happy with this outcome and will receive her replacement model shortly.

Nicola Rutzou
Dick Smith public relations and promotions manager

Have you ever bought a comparatively inexpensive IT product only to encounter problems having it replaced or getting a refund when it became faulty? What was the outcome? Write to us at service@acptech.net or Service & Reliability, APC, PO Box 4088, Sydney NSW 1028. Letters may be edited for length or clarity. We regret that not all letters can be personally answered.



Dear APC,

I recently purchased a NeoGeo Pocket Color (similar to a Game Boy) handheld gaming console and two games cartridges by COD from Blade Electronics in Queensland.

When I returned home from the post office (after paying for my order and collecting it), I found that one of the games cartridges was missing. The box for the game and the instructions were included in the package, but not the game itself.

I sent Blade Electronics an email telling them about this. Shortly after, I received a reply which said a replacement would be sent out quickly. No replacement ever arrived, and now the company is ignoring my emails. Can you help me with this?

Gordon Maxim
Internet



Dear APC,

I'm disappointed with the executive leather carrying case I bought with my Gateway 9300 notebook computer. While the case looks OK in terms of design, it's extremely poor quality.

The side strap that holds up the shoulder belt is made out of 1mm thick card, and only 2mm of card was holding up the 3.5kg notebook computer. After a few days, the strap tore from the belt. Luckily I wasn't on the road, so my notebook computer was not damaged. However, I'm trying to get a refund from Gateway but am not having much success. This is not the only design flaw in the case. There are many others.

- The hooks on the shoulder belt are badly designed and unhinge easily from the straps if accidentally bumped.
- There's a pocket with a hole on the back that doesn't seem to serve any purpose. There's a button that clips over the pocket which also serves no purpose.
- It's not made of good material. 1mm card is good for making models but not good for holding up computers.

This case added an extra \$129 to the Gateway package.

Jason Gan
Internet



Online purchasing methods are
rapidly improving.

Bidding for bulk buys online

For a long time, the IT industry has raved about the mammoth savings businesses can make by moving highly expensive purchasing procedures online, but the complexity and expense of doing so has kept it out of reach of all but the largest and most determined enterprises. However, recent developments in online purchasing are showing promise for businesses of all sizes, as online trading communities enable bulk purchasing and rapid negotiation of competitive supply contracts.

Previously, businesses that wanted to get into electronic purchasing not only had to develop their own systems, but also had to help their trading partners use those systems. Some large companies now use technologies based on EDI (Electronic Document Interchange) to exchange goods with select suppliers, but inefficient and expensive manual procedures and repeated low-volume purchases are still common.

Bigger benefits come when businesses can use online purchasing systems to place orders together with other businesses and streamline existing order-handling processes. Rydges Hotels and Resorts

"We believe our customers can save 10% to 15% of their expenses on maintenance, repair and operations purchases."

recently implemented Purch@se Point Technology's Lotus Notes-based MarketPlace purchasing system to improve trading in fruits, vegetables and meats.

Each hotel used to buy its food independently from a variety of different sources, which saw them paying a range of prices for the same product. Using MarketPlace, chefs create a list of their combined needs, then post their requirements online.

About 200 suppliers review the hotels' needs and submit competitive bids. The chefs choose the supplier most able to meet their needs at the right price. Through an interface with Rydges' WinCheck inventory management system, MarketPlace automatically generates and transfers the purchase orders, invoices and other documents to the supplier.

Many industry associations are working to extend group buying powers and seamless exchange of goods to all companies working within particular

industries, such as pharmaceuticals and automotive supplies. In turn, enterprise resource planning software vendors are adding procurement management capabilities to their core platforms as part of the push to extend beyond the corporate boundary.

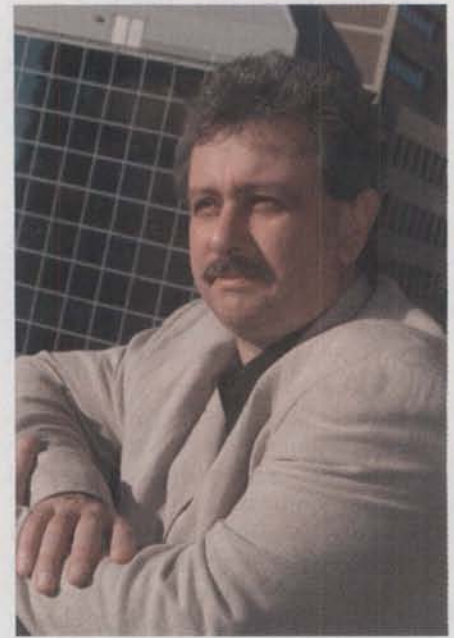
"The beauty of these applications is that they offer a 30-second shopping experience," Harry Child, Australia-New Zealand managing director of ebusiness supplier Epicor Software said. "Standard business processes like recruiting a new employee, running an event or buying pens can be stored and resubmitted later. It's trying to eliminate the need for the manager or person in the field office to go down the road to the local shop and buy something. Every time you do that, you don't take advantage of your relationship as a corporation with other suppliers. We believe our customers can save 10% to 15% of their expenses on maintenance, repair and operations purchases."

Recognising that volume is critical to success, in July many of Australia's largest companies — including Amcor, AMP, ANZ, Australia Post, BHP, Coca-Cola

Amatil, Coles Myer, Foster's, Goodman Fielder, Orica, Pacific Dunlop, Qantas, Telstra and Wesfarmers — announced they will develop corProcure, an online trading network expected to handle over \$8 billion in goods and services by 2002.

Delivering on the promise of these internal systems still requires considerable work on implementation, as well as a well-organised system to make the transactions run smoothly. Australia's big four banks are rushing to secure their share of the estimated \$300 billion total indirect purchasing market by establishing online marketplaces of their own. ANZ is scaling up its anzebiz.com online purchasing service after a trial period involving more than 30 participants, the Commonwealth Bank launched eComm-Supply in February, and Westpac and the National Australia Bank are developing their own services.

Although online purchasing services can improve the acquisition process,



▲ Lloyd-Jones: In the club

companies still have to develop internal processes to complete the purchasing cycle. In particular, buying groups will need to develop a smooth way of dividing up the content of bulk purchases without eroding the level of efficiency they've achieved by ordering this way.

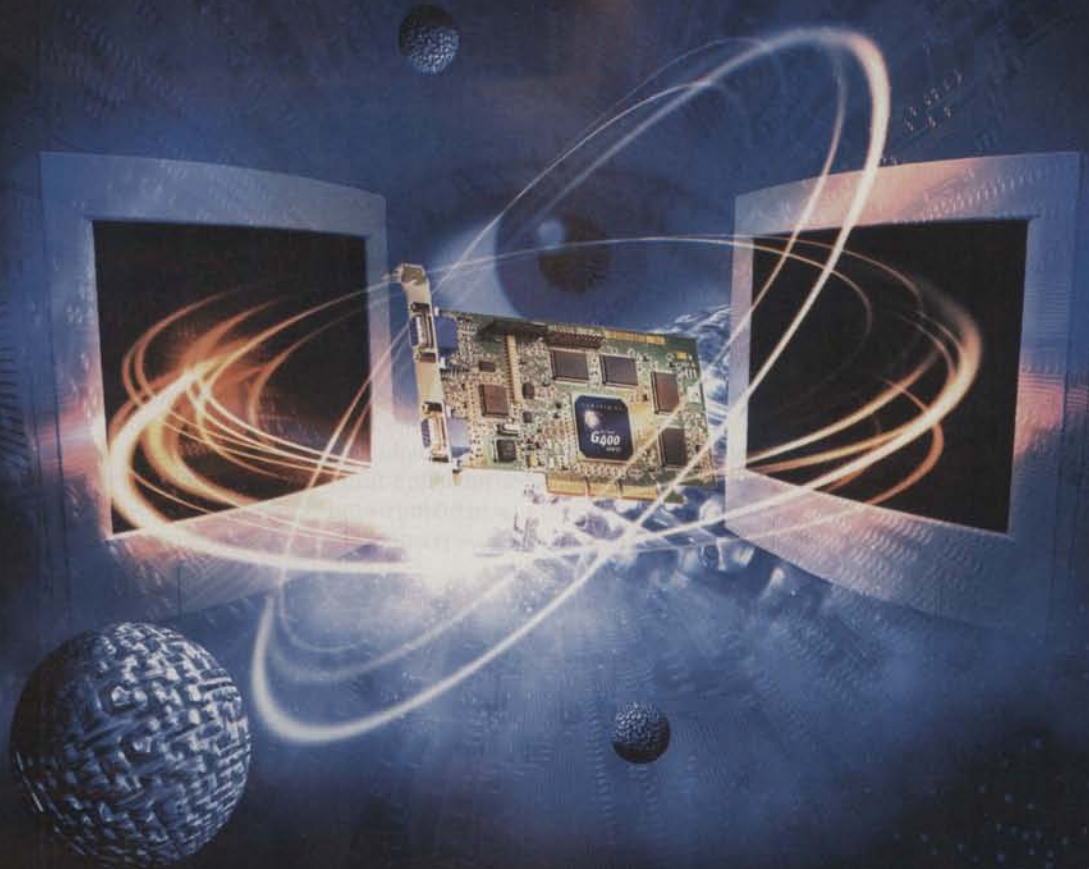
"When you start looking at demand aggregation, you find that these other factors will come into play," said Steve Lloyd-Jones, managing director of MRO.com, a subsidiary of ERP vendor PSDI and ANZ's technology partner for anzebiz.com. "If you're going to club together in a forum like that, you've all got to buy the same things — so quite often the organisational complexity rises directly [in proportion to the number of businesses aggregating their demand]."

"You have to look at that organisational complexity, and be quite disciplined in the way you go about these things. There's a trend towards desktop receiving; the idea is that you deliver to the point of use and the individual that was responsible for ordering the goods then gets them. I've seen situations where things will arrive on an office floor and nobody knows who they're for."

David Braue



David Braue can be contacted at
david@braue.com.



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What does it mean for physics if scientists can make light travel at over 300 times its accepted speed?

Let there be... oh, there is

As Neils Bohr, one of the fathers of quantum mechanics, once said "anyone who can contemplate quantum mechanics without getting dizzy hasn't understood it." This month's Cutting Edge is about light and how fast it travels.

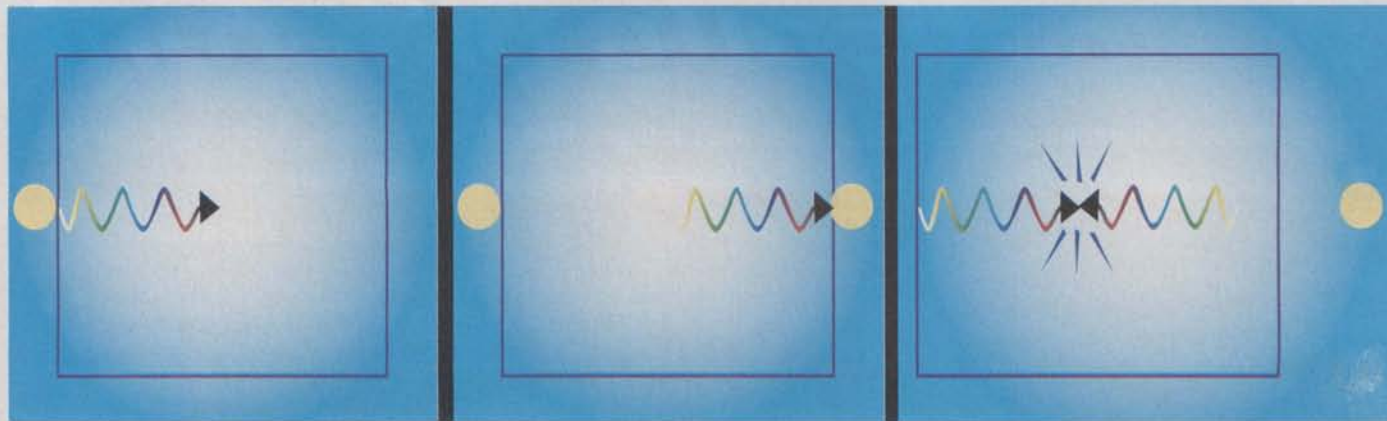
Light traveling faster than light should be impossible, but in a report tendered to *Nature* magazine and currently under peer review, Dr Lijung Wang at the NEC Research Institute in Princeton, New Jersey, performed a feat that has stood physics as we understand it on its head. His experiment to see if light could be sped up had one incredible and totally unexpected result — the test pulse of light exited the test chamber before it even entered it.

bending of space/time so that it is possible to get from point A to point B faster than light can when travelling in a straight line, but this is less a case of travelling faster than light and more a case of taking a kind of short cut through space — possibly via black holes or wormholes.

This limit to the speed of all things was finally settled on in 1983. The accepted speed of light has changed over time due to the improved methods used to measure it. The first method, watching Jupiter eclipse its moons in 1676, was highly inaccurate by today's standards. Kerr Cell shutters were used in 1951, and this came within 0.3km per second of the actual rate. Atomic clocks give the most accurate measurement

ber, it agitates the cesium atoms that are used to give energy to, and amplify, a secondary laser fired into the chamber. The test chamber is normally used for amplifying lasers. Wang's team fired in a pulse of light instead, specially tuned so that the cesium wouldn't amplify it like it would the laser, but instead increase its speed.

Whether Wang achieved superluminal speeds or not is yet to be accepted. An alternative theory of what happened is that the cesium acted as a wave, interpreting the impending light pulse and spitting it out the other end before the pulse had fully entered the chamber. The light in the cesium gas displayed wave properties similar to those observed in plasma: the wave could move



▲ As the tail of the light pulse (which in another curious twist can enter before the head of the pulse) enters one side of the chamber, the cesium gas can determine the size, length and shape of the incoming light wave.

▲ The cesium then imitates the entire light wave, speeds across the chamber and emits a perfect replica of the still incoming light wave.

▲ The cesium wave then rockets backwards across the chamber at 300c, collides with the incoming light wave and they both cancel each other out. To the observer ignoring this middle step, it appears light has exited before it has entered.

While you digest that, let's look at what we know about light and the speed of light. Einstein's special theory of relativity states that the closer to the speed of light an object travels, the greater its mass becomes. This has been measured and proven many times. A photon (particle of light) is the exception to this rule. It has either no mass, or so little mass that it makes no difference no matter how fast it travels. This negligible mass allows photons (light) to travel at an exceptionally high speed.

It is the increase in particle mass at near light speed that makes it impossible for anything to achieve faster-than-light travel. Physics theoretically allows for a

to date with the speed of light in a vacuum (c) measured at approximately 186,000 miles per second (299,792,458 metres per second). By definition, the speed of light is a constant, but this speed can slow depending on what matter the light is passing through. The degree to which it is slowed is the 'refractive index' of the medium through which it is passing.

Breaking the speed of light would invalidate the special theory of relativity and render obsolete its many supporting tests. Wang's experiment appeared to show light exiting a test chamber before it had entered — a speed increase of over 300 times c . The test chamber was a transparent tube, filled with prepared cesium gas. When a laser pulse is fired into the cham-

backwards and forwards simultaneously.

Physicists have observed similar phenomena before, but not so spectacularly, and it is not clear exactly how the cesium chamber reconstructs the light wave. No applications for this technology have been developed yet. You couldn't send information back in time, for instance, as the original light pulse would arrive before you could decode the original information. With cesium acting as the speeding agent, the special theory of relativity holds.

Darren Ellis



Darren Ellis can be contacted at dellis@acptech.net.

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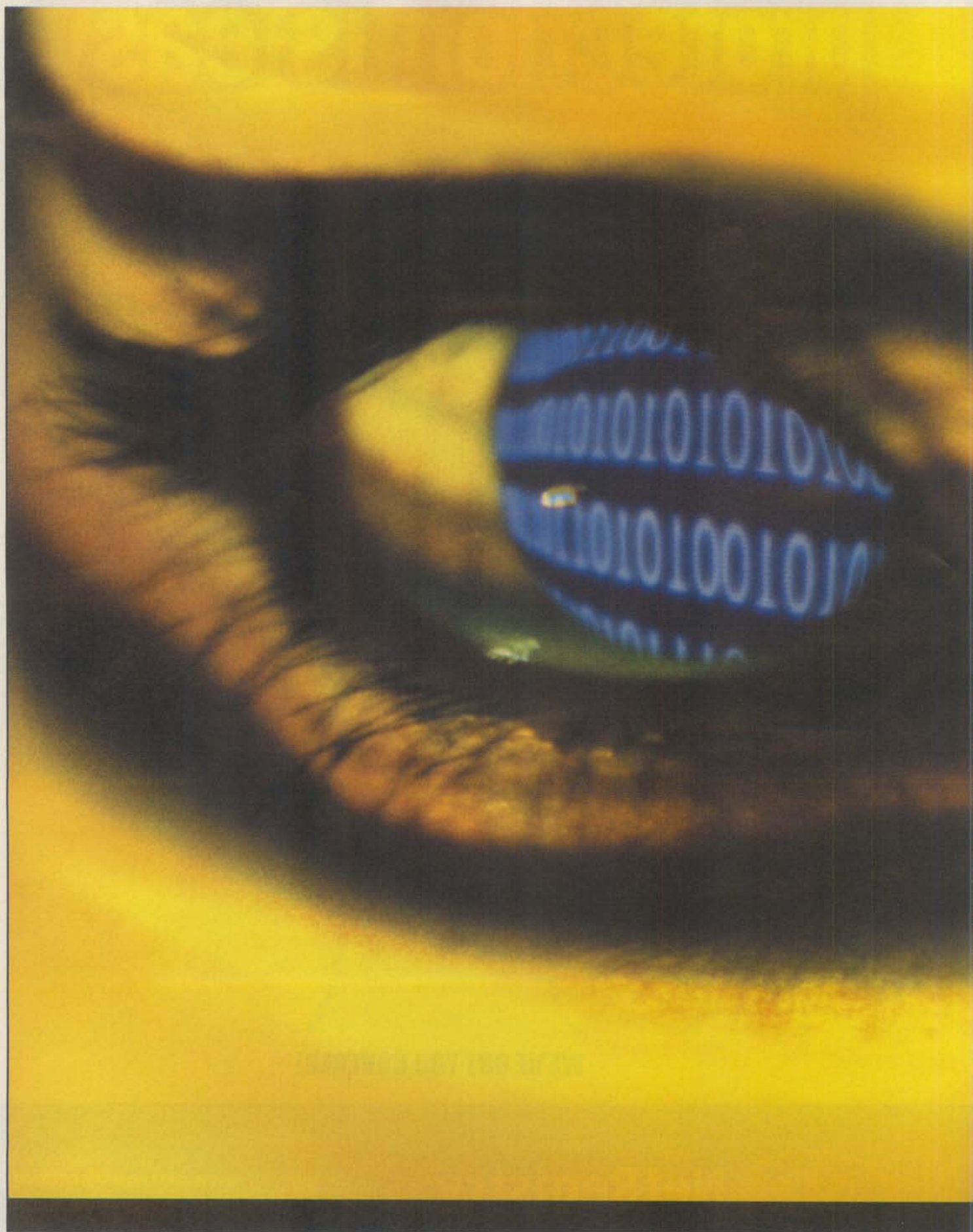
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Sense of Security

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You can misplace your ID card or keys, and forget your password and personal identification number, but you take your hands, eyes and face with you everywhere you go. Biometrics means fast personal identification and verification for business and home security. **By Darren Ellis**

Biometrics began in 1882 when Alphonse Bertillon proposed that the heads and bodies of criminals should be measured to help keep track of them. Despite problems with inaccurate measurements, the Bertillon system (also called Bertillonage) was used for a number of years. This classification system was groundbreaking, and was only superseded by the use of the fingerprint as a unique identifier.

In 1901 the Galton-Henry system of fingerprint classification was instituted alongside Bertillonage at Scotland Yard. Some countries ditched Bertillonage altogether in favour of the new method. It was the case of Will West that put the final nail in the coffin of the Bertillon system.

In 1903, Will West was arrested and taken to Leavenworth Penitentiary. Records indicated he had served an earlier sentence there, though he strenuously denied it. A prison guard identified West, and produced a Bertillon identification card with a photo that looked identical to him. To confirm the match, West was measured up and compared to the Bertillon statistics on the card. It was only at this point that the guard noticed a memo on the back of the card indicating that the subject, a William West, was *already* imprisoned at Leavenworth. Not only did these two men have similar sounding names, they also looked alike and had almost identical Bertillon statistics. The only measurements that differentiated the two were their fingerprints. Since that

time, fingerprinting has been the primary way of identifying criminals around the world. The FBI has over 232 million sets of fingerprints on card files, which are currently being computerised.

Biometrics is not always about catching criminals. These days it has many applications, including securing buildings, rooms, computers and files. There are also many methods used to capture the data necessary for biometric security.

The power of biometrics

Whenever a new biometrics technology is publicised, concern over freedom and privacy resurfaces. How can we be sure we are not being identified and tracked without our knowledge? Monitor-mounted Web cams with built-in iris recognition (the cam tracks your face and zeros in on your eyes so the iris camera can take a snap) are already available. The CSIRO has tested its facial recognition technology and proved that it's accurate. Could it be that those security cameras dotted around our cities will soon begin to recognise and track us?

Biometrics technology is becoming so accurate and fast that it is no longer a far-fetched idea. Many people fear a Big Brother scenario. The Australia Card controversy of the 1980s demonstrated the depth of public feeling against a new form of identification. What many people don't realise is that their driver's licence works in a similar way to the Australia Card proposal.

The driver's licence is an example of simple biometric identification. It uses two methods: face recognition and signature recognition.

In addition to the fear of Big Brother, there are cultural objections to biometrics that are hampering its use. For religious reasons, some ethnic groups are reluctant to provide fingerprints for police, and are even more reluctant to agree to using a fingerprint scanner. There are also safety fears over some of the biometric capturing methods, particularly retina scanning, and hygiene concerns about biometrics devices that many people touch. Not all these fears are justified; as one biometrics manufacturer pointed out, "What do you think happens every time you grab a door handle?"

Biometric technologies are incredibly accurate. They offer ways of capturing data about you that can only come from you. While a driver's licence is carried on your person, allowing you some control over how its information is accessed and used, it's more difficult for you to control how your biometric information can be taken from you and used.

There is a common misconception that biometric data collected by new security devices is photographic. Biometric devices condense what they detect into numbers. This information is encrypted using either proprietary algorithms or encryption algorithms. This makes it impossible to work backwards from the strings of digits.

The biology of biometrics

Biometrics is used for two main purposes: identification and verification. Put simply, identification is finding out who you are, while verification is ensuring that you really are who you say you are. This is an important distinction, as most biometric devices are better suited to either one or the other.



The way the system works also depends on whether it's for the purpose of identification or verification; identification involves a comparison of one biometric sample to many stored templates, and verification compares one sample to one template, producing a simple yes or no result.

There are also two measurements that indicate how good a biometrics system is. The first is the false acceptance rate (FAR), which indicates how many times a system recognises you incorrectly. The second is the false rejection rate (FRR), which shows how many times a system rejects you incorrectly. The FAR indicates the likelihood that the system will recognise an impostor trying to access your data or security area, and the FRR indicates the odds that the system will incorrectly deny an approved person access to that data or security area.

Many biometric devices allow you to adjust the FAR and FRR settings, but changing one affects the other. Decreasing the instance of FAR (making it harder for an impostor to pass the system) only increases the FRR (making it more likely that an approved person will be rejected) and vice versa. These days, FAR and FRR settings are extremely low, and although no system is 100% foolproof, the chance of false acceptance or rejection occurring is negligible.

There are a few biometric application program interfaces (APIs) to choose from. The most popular is HA-API (Human Authentication API) which allows developers to produce hardware and software that is compatible with any other hardware and software. For instance, the SAF2000 software from Triton Secure will work with many HA-API-compliant hardware devices.

As a response to the predicted release of more and more biometrics products, the BioAPI consortium was formed in 1998 to provide the next stage of the biometrics API. This consortium has over 50 members including Intel, Compaq, Infineon Technologies (formerly Siemens) and NEC, as well as many leading biometrics companies. The first draft of version 1.0 of the BioAPI has just been released, and has integrated the HA-API specifications, including the plans for HA-API version 2.

Microsoft chose I/O Technologies' BAPI (Biometrics API) over BioAPI for integration into future versions of Windows. Soon after, in what must have been a blow to Microsoft, the US Government released a statement saying that any biometrics (hardware and software) installed in government computers or installations must be BioAPI compliant. Now the biometrics industry is waiting to see if Microsoft will do a turnaround.

I may not be on the system, but what if I bring the parts?

One of the most common questions about biometrics is that of whether it's possible to get around the system by cutting off fingers, hands and heads, or gouging out eyes and presenting them to the biometric reader. This scenario has been popularised in books, television and movies, but the reality is that such gruesome techniques won't work with most biometric systems today.

Iris scanners can detect rapid eye movements, and a dead iris looks nothing like a live one. The same goes for the retina, as its vein patterns disappear rapidly. Dismembered hands and fingers shrink within minutes, and they no longer have the correct capacitance (or ability to store electrical charge) for some readers. As for voice or face recognition, recordings and photographs can usually be detected as fakes. However, APC managed to enrol a magazine photograph in one face recognition system. This technology is still not near the standard it should be.

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Under the thumb: fingerprinting

Pottery in ancient China was sometimes stamped with thumbprints in an effort to discourage theft and forgery. A more sophisticated form of fingerprinting has been used around the world for over a century. It is one of the most stable and trusted methods of biometrically identifying a person, but not many people really understand how it works.

Almost everyone has eight fingers and two thumbs, each with a unique print consisting of ridges and indentations. These ridges increase the surface area of your finger and enable you to pick things up (having smooth skin would make the fingertips slippery). The

ridges and indentations that make up a fingerprint can be measured by biometric devices. Basic pattern types are arches, loops and whorls, which are further divided up according to size and shape. Within these pattern types, there are what are called 'minutiae points' or characteristics of the fingerprint pattern (usually these are breaks, splits or spurs on ridge lines).

Every minutiae has five further characteristics that define it, such as type (loop, dot, bifurcation, ending, beginning), orientation, curvature, frequency and position. With anywhere from five to 70 minutiae on each print (each with five unique identifiers) it's easy to

understand why fingerprinting is so effective and has stood the test of time.

APC tested two products with different fingerprinting technologies: silicon (Veridicom 5thSense PRL scanner, see page 78) and optical (Digital Persona's U.are.U Pro, see page 78), but there is another emerging technology that is worth mentioning. Ultra-Scan has developed a way of using ultrasound to detect the ridges and furrows on the finger. Chile is using this technology in its healthcare system to identify patients. Ultra-Scan executive vice-manager William Smith said that in laboratory tests, it was able to scan a full print from a nine-month-old child.

Digital Persona U.are.U Pro

The U.are.U Pro unit is extremely easy to set up and use. It is used primarily for limiting system logons, but it takes biometrically securing your system one step further.

The supplied software installs two applications on the system: One Touch applications and the administrator console. The console is similar to the logon rights and user permissions screens from Windows NT and Windows 2000. Users



can enrol any of the fingers on both hands on the system. A diagram of a pair of hands then shows which fingers have been enrolled on the system. In case there's a problem with either the scanner or the user's hands, you can also set a password.

The One Touch applications are used for filling in forms on the Internet or in any Windows-based program. One Touch stores personal details with each fingerprint, so you can automatically fill in an entire form just by scanning a finger.

Another handy option is the ability to lock the system quickly. The Digital Persona icon in the system tray allows you to do this instantly. Any program running in the background will still run, but like logging on, it takes a finger scan or pass-

word to unlock and re-enter the system.

The unit is a USB-connected scanner. The rotating connector that allows the cable to run either to the front or the back of the scanner is a nice touch.

Private Space is an optional software feature which partitions and encrypts a section of your hard drive. Again, only a finger scan can unlock the encrypted space or files.

Contact Digital Persona

Phone N/A

Online www.digitalpersona.com

Price \$US149.00

In short Everything about this scanner is user-friendly. Perfect for home or small business.

SecuGen EyeD Mouse II

This is the first of two reviews based on the biometric service provider (BSP) modules that come with the SAFLink SAF2000 biometric security software supplied to APC by Triton Secure. SAF2000 is a set of biometric security applications for Windows 95/98/NT 4.0 and Novell Network 5.0.

The beauty of this software is that it allows for multiple, simultaneous biometric measures, including face recognition, voice recognition and fingerprint scanning. The software is extremely well designed for network security, but it's not so good for standalone Windows 95/98 applications.



However, the hardware is not quite as impressive as the software. The EyeD Mouse II is more compact than the U-Match BioLink Mouse, but has a

design quirk that could be annoying for those with large hands. The thumb needs to be positioned very carefully against a ridge of plastic above the scanning window, so that it is centred exactly on the scanner. This is because the scanner window is much smaller than the one on the BioLink mouse.

The unit we reviewed used the parallel and PS/2 ports (it also has a PS/2 passthrough). There's a USB version as well.

Contact Triton Secure

Phone (02) 9929 2511

Online www.tritonsecure.com

Price SecuGen EyeD Mouse II \$287, SAF2000 with four licences \$385; with 10 licences \$974; with 50 to 99 licences \$96.80 per licence

In short It's smaller than the U-Match BioLink Mouse, but the design could be a problem.

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U-Match BioLink Mouse

In the US, BioLink relies heavily on one hardware product — the U-Match mouse. Different software options are available with the mouse, from a home system protection package (which comes with NetNanny filtering software) to office system protection and biometric-enabled Web sites. We looked at the basic package, which consists of the U-Match BioLink Mouse and some basic application software.

The mouse has a very nice sweeping design and a silver/grey finish. It's almost one-and-a-half times thicker than other mice because it incorporates the finger-print scanner within its housing to scan your thumbprint. It is comfortable to use,

particularly if you have big hands. Those with small hands may prefer the SecuGen mouse (see page 76).

In the basic version, the mouse can only be used as a logon tool. This utility is on the software CD.

It's a good security device for Windows NT 4.0 or Windows 2000, and it was possible to get around it in Windows 95/98 by booting in safe mode. If

you're looking for basic biometric security, this mouse works best with a more secure operating system. It also supports Unix.



Although the software loads up with an image of your thumbprint on the screen, it actually extracts numerical information from your print and compares it against the numerical template on the drive. BioLink claims an FRR of 0.01% and an FAR of one in a billion.

The mouse is powered totally off the PS/2 port. The bad news for left-handers is that it only comes in a right-handed model.

Contact BioLink

Phone: N/A

Online www.biolinkusa.com

Price \$US119 with basic logon software, \$US129 with extra file security

In short A good mouse for logon security.

Veridicom 5thSense PRL

The Veridicom 5thSense PRL finger-print scanner is a stand-alone unit designed to sit on the desk next to your keyboard. Unlike the U.are.U Pro scanner, which uses light to determine fingerprint patterns (the light is absorbed by the ridges in your print, giving a clear pattern) the 5thSense PRL scanner uses electronic capacitance to determine a fingerprint. To do this, the scanner has a electronic chip which you rest your finger on. Where the ridges on your finger touch the chip surface, the electronic capacitance changes and the scanner builds an image.

Using a chip to read prints has its pros

and cons. The biggest drawback is that the chip surface has to be large enough to accommodate a fingerprint, which makes it more expensive to manufacture. However, it is highly accurate — more so than scanning with light.

After installing the SAF2000 software, you enrol users.

With your finger on the scanner you can watch the fingerprint image as the sensor adjusts to your finger movements. When you have a good image on the screen, you click on 'capture' and it takes a snapshot. Enrolment usually con-

sists of two snapshots. Only one finger can be enrolled at a time, unlike U.are.U Pro, which allows for up to 10. Logging on to the system is similar — once you're happy with the fingerprint image, you capture it.

The scanner is strongly constructed and easy to use.

Contact Triton Secure

Phone (02) 9929 2511

Online www.tritonsecure.com

Price Veridicom 5thSense PRL \$423; SAF2000 with four licences \$385, 10 licences \$974, 50 to 99 licences \$96.80 per licence

In short A corporate alternative to U.are.U Pro.



It rings a bell: face recognition

Face recognition is not an exact science, but the CSIRO has made great inroads into the technology. Recognising people by their facial features is one of the oldest forms of biometric identification. We do it many times every day. Humans look at the overall face: skin tone, bone structure, eye colour, eyebrows, nose, mouth and so on. It takes less than a second to recognise a person, and we take this for granted, but teaching a computer to do the same thing is very difficult. There are four different types of facial recognition used by computers: eigenface, neural network mapping, automatic face processing and feature analysis.

Eigenface is a technology patented by MIT that uses a set of greyscale images of the face. As with most biometric methods, your eigenface is transformed into its numerical equivalent, which is about one-hundredth of the file size, and stored. When you next approach the camera, it will take a greyscale picture and compare the values against the stored file.

Neural network identification is used by eTrue (see TrueFace review, page 80).

Feature analysis is the most popular form of facial recognition, because it can see through wigs, disguises and different facial expressions. Devices that use this look at the overall face, and also zero in on certain localised facial features and

use the different characteristics of these, such as the distance between them, to make the face map.

Automatic face processing is not quite as reliable as the more widely used feature-analysis recognition. It compares each face to stored measurements for different facial characteristics, for instance the distance between the eyes, the length of the nose and mouth size.

A new technology used by Technology Recognition Systems goes beyond facial geometry and uses an infra-red camera to make a thermal map of the face. Apparently this works well, although skin temperature may change due to weather conditions or exercise.



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www.geniusnet.com.tw

eTrue TrueFace

eTrue TrueFace uses a neural network to make an identification or verification. The system compares your face against a stored template, and the software algorithm takes a 'vote' on whether the live

face matches the template closely enough to allow or deny access. From this, the software adjusts the credence it gives to certain facial features. According to eTrue, this enhances its ability to confirm or deny matches in the future.

It works with an ordinary Web cam. The software we looked at — the TrueFace sales demonstration version — has an easy-to-use interface. To register your face, you just line it up with the camera and click 'enrol'. After taking the first snapshot, the software produces another four or five photos in quick succession.

You can then use the software either to identify people or verify their identities. This is done by clicking on either of the buttons and positioning your face in front of the camera. Once you have your

face centred, the system only takes a few seconds to recognise or reject you.

APC found that a good quality magazine photo could be enrolled in the software at the default stringency setting, which casts doubt on the software's reliability. However, after adjusting it to a higher setting, the photo wouldn't work. Still, APC would recommend TrueFace for the merely curious, rather than those serious about security.

Contact eTrue

Phone N/A

Online www.etrue.com

Price Contact distributor

In short The demonstration software is not very secure, but it does provide fast recognition.



Put it there: hand and finger scanning

Hand scanning and finger scanning are totally different from fingerprint scanning. They are more accurately described as hand and finger geometry. The market for hand geometry is dominated by Recognition Systems (see the review of HandKey II below), but other devices, such as Dermalog's upcoming Hand-ID product, are now being manufactured. Unlike the HandKey series of products that require the hand to be placed just so, using pegs as

markers to guide you, the Hand-ID allows you to place your hand on the reader at any angle.

The finger geometry market is dominated by Biomet Partners. The technology works in much the same way as Recognition System's hand geometry products, but it only requires two fingers.

An interesting product not reviewed here is BK System's vein scanning biometric. When you place your hand in the reader, a CCD takes an infra-red

image of the back of your hand, which highlights the pattern of veins hidden beneath the skin. An algorithm then converts your vein pattern into a string of numbers based on factors such as length and relationship to each other, including angles and crossings. BK Systems officials claim that not even identical twins have the same patterns. Because the veins are hidden beneath the skin, a pattern would be difficult, if not impossible, to replicate.

Recognition Systems HandKey II

Hand scanning and hand geometry are two of the oldest forms of electronic biometrics — they have been available for over a decade. The HandKey II is a corporate device used more for verification purposes, such as door/area security and time and attendance recording, than for identification, although it can be used for both.

You have to rest your hand on a metal platen. Using the system takes a little getting used to, as there are pegs on the platen to position your hand exactly where the reader needs it. You could be forgiven for thinking that your palm is being scanned, but the opposite is true. From the box above your hand, a perfect grid of infra-red lights shine on to the back of your hand. This grid is picked up by the CCDs in the unit. As they curve around the contours of your hand, the lights produce a 3D image of your hand and fingers. The HandKey II measures 90 distinct points, including fin-

ger and hand length, width and thickness. The reader can adjust to varying swellings and contractions of your hand caused by weather conditions or exercise, as the hand's dimensions change uniformly.

Coupled with the reader is a simple PIN pad, which is useful for verification. The system reads right hands only, but if you are missing your right hand or it is injured, you can place your left hand upside down on the reader to enrol. Some people's left and right hands are an exact geometric match and can be used interchangeably.

There is a higher chance that two people will have similar hand geometries than other biometric measurements, but the FAR and FRR are still one in a thousand. This is not as low as some other biometric methods, but it's more than adequate for most access or attendance tracking applications.



Contact EDSales

Phone (02) 9418 6999

Online www.edsales.com.au

Price Contact distributor

In short A fast and reliable product, well suited to verification.

Be seen: iris recognition

Many people shudder at the thought of iris scanning. Forgetting their basic biology (the iris is at the front of the eye, the retina is at the back), they assume it's an invasive technology. The iris is actually the only internal organ visible externally.

Iris scanning is totally non-invasive, because instead of touching the eye or having lasers shot into it (see 'Windows of the soul: retina scanning', page 82), iris scanning technology uses a high-definition photograph of the iris for identification and verification.

Apart from DNA, the most complex biometric data that can be collected

from a person is provided by the iris. Each iris has over 266 unique points of data that are measured to produce a biometric profile. This data is taken from the visible parts of the iris such as the trabecular meshwork (the coloured part of the iris) and the corona, either under normal light or infra-red light.

The trabecular meshwork refers to the streaks and lines that radiate out from the pupil. It's formed by the stretching and tearing of the tissue as the iris develops. The iris has formed by about the eighth month of gestation and is not influenced by genes, which is why even genetically

identical twins with matching fingerprints can never have identical irises.

According to Dr John Daugman of Cambridge University, who developed the iris pattern recognition algorithms (and currently holds all of the patents to the technology), the chances of two irises matching 75% of pattern data is one in 10^{16} . All iris-scanning products further decrease these already tiny chances by allowing you to scan both left and right irises into the system (these differ as well). The odds of matching a person's two irises with another pair are one in 10^{52} .

LG IrisAccess

All iris scanning is based upon the work of Dr John Daugman of Cambridge University. IrisScan is the only owner and developer of iris-scanning biometric technology — it licenses other companies such as LG to use the technology.

Iris scanning has been in the international news in recent months with its introduction at bank ATMs overseas. Iris Australia is IrisScan's Asia-Pacific arm. Although we are yet to see iris-scanning ATMs in Australia, Iris Australia sells LG's access control products.

APC looked at the latest version of the IrisAccess device, and got an early peek at an IrisScan product that will be available in Australia in the future — a handheld iris scanner that looks like a shower rose. The IrisAccess hardware looks similar to HAL9000 and speaks to you, asking you to look into the camera.

Three high-definition photos are taken. The camera uses three infra-red lights, set around the camera ring, to illu-

minate the iris. When registering your irises on the system, you can see the eye and iris being captured on the PC, but you don't see this in normal use.

Currently images are captured from within 7 to 23cm from the camera. New technology is on the way that will allow the iris to be positioned up to 90cm away from the camera, which is better for door access.

Using the algorithms developed by Dr Daugman, the photographic data is converted into a 512-byte IrisCode. It's this IrisCode, rather than the photographic image of your iris, that is kept on the system. Its small file size helps when performing one-to-many searches.

It is impossible to work backwards from an IrisCode to develop a picture of the iris. IrisScan has demonstrated that for verification purposes, an IrisCode can be placed



on an ID card which can be read by a normal barcode scanner. Coupled with an iris scanner, this is a formidable verification technology.

IrisAccess is aimed at the corporate market.

Contact Iris Australia

Phone (02) 9939 8801

Online www.irisaustralia.com.au

Price Contact distributor

In short It's a great technology and well implemented.

Upon my word: voice recognition

Voice recognition products such as Dragon NaturallySpeaking, IBM ViaVoice and Philips FreeSpeech are trained to work out which words are being said, regardless of who is saying them. Biometric voice recognition software for security does the exact opposite; it doesn't necessarily care what is being said, but who is saying it.

Voice pattern matching is not a new technology; it has been around for decades. Everyone has a unique voice

pattern derived from behavioural and physiological factors. Usually, you need to train voice recognition biometric systems to recognise your voice as you say a certain password or pass phrase. The problem with this is that repetition can make a pass phrase sound flat, making it easier to imitate.

Not all the packages require a password or pass phrase, but you still have to train the system to recognise your voice.

You can buy many retail packages that lock your system or files with a spoken password. Like iris scanning, voice scanning is non-invasive and hands-free. If you have a wall or desk-mounted microphone, you can stand well clear and speak your way in. Today's voice pattern-matching software can identify your voice even if you are out of breath, have a cold or are starting to lose your voice, but these factors increase the false rejection rate.

It's in the genes: DNA identification

The human body develops, in part, through the 'reading off' of particular gene combinations found in the chromosomes (long strings of genes) in each cell. This occurs as a result of the convergence of environmental, hormonal and genetic factors. Certain patterns in the genes that don't contribute to the function of the gene are called 'DNA satellites'. These

patterns, which recur within different cells, are used for DNA typing, also called 'DNA fingerprinting'.

If you only have a small fragment of DNA, you can use a polymerase chain reaction to replicate the strand thousands of times. The final DNA pattern is unique to each person; the only people who are not genetically different are identical twins split from the same zygote (fertilised egg).

In the last two decades, the concept of identifying people by their DNA has passed from a possibility to a reality. DNA

testing is extremely accurate. The willingness of over 1,500 men in Wee Waa, NSW, earlier this year to undergo DNA testing to solve a crime, illustrates our trust in the accuracy of DNA testing.

At the moment, there are no commercially available DNA fingerprinting products, due to the difficulty involved in processing DNA, not to mention the time it takes (approximately 14 days to three weeks). Obviously, this is not yet a viable security application, but it may not be too many years away.

Windows of the soul: retina scanning

The retina is the thin nerve at the back of the eye. It's responsible for detecting light and transferring this information along the optic nerve to the brain. Using the retina as a biometric identifier is a concept that has been studied since the 1930s. Of the four layers of the retina,

the uppermost layer is scanned, because it contains a unique vein pattern. Unless you experience a head injury or degenerative disease, retina scanning can be used throughout your whole life.

The biggest problem with retina scanning is that it's an invasive technology. Not many people like the idea of beams being shot through their pupils to map their retina. Retina scanning also

requires you to hold your eye between one to two-and-a-half centimetres away from the reader and to keep as still as possible, so it isn't very comfortable.

Currently EyeIdentify is the only commercial retinal scanning product available. The manufacturer says the system uses 400 unique identifier points in the retina, which is many more than a technique like fingerprinting.

Sign language: signature recognition

The signature has been used for centuries for both identifying and verifying people, and is still in use. Even today, most signature recognition relies on a visual comparison between a pre-signed card and a form (such as your credit card and the credit card slip signed when

making a purchase). With new technology, signature scanning (or dynamic signature recognition (DSR)) has entered a high-tech realm.

DSR differs from the everyday method of evaluating signatures (that is, by visual comparison) as it also takes into account factors such as the speed with which you sign, the order in which you write parts of your signature and the pen pressure for different parts of the signature.

A few manufacturers have released products for signature scanning. These products come in two parts: a pen for writing the signature and a tablet for capturing the signature information. DSR is good, but not entirely infallible. People don't always sign their names exactly the same way each time, and although there is tolerance built into the signature systems, the FAR and FRR are not as low as other biometric methods.

Other biometric systems

There are many other technologies available now or under development. BioPassword recently announced that it has developed a system of keyboard pattern recognition. This is a technology that uses individual typing patterns to determine who is typing on a keyboard at any given time. This is not as far-fetched as it may sound. During World War II, and before, people could tell who was sending Morse code messages because of their 'fist'.

Like signature recognition, this is a behavioural biometric. There are a number of outlandish biological biometric systems currently available. Systems based on physiognomy include comparisons of the ear, the shape of the lips and

even the creases in the knuckles.

The most interesting of these is the concept of fingernail identification. Take a look at a nail on your hand, and you'll notice faint parallel lines running along it. AIMS Technology is developing a scanner that will read the lines and convert them to a pattern similar to a barcode. You can then be identified by scanning your nail in much the same way as you would scan a product at the supermarket.

Even more outlandish are the methods of determining identification from gait, smell, salinity and skin. Everyone has a distinctive walk, and apparently a lot of work has gone into pattern matching these qualities, which are able to distinguish people, even in a crowd.

Similarly, everybody has a distinctive smell, composed of over 30 different elements. Variations in these 30 elements can clearly identify an individual. A reader currently under development can detect your smell from your hand, and is apparently very unintrusive.

Another technology under development is body salinity, which is being jointly researched by MIT and IBM. It is based on an idea for PANs (personal area networks) for transmitting data between individuals by exploiting the body's electrical field and salinity levels. This is not an identification or verification application; rather, it's a way of initialising systems and transmitting data based on biometric information.

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IT'S A SMALL WORLD

*Few developments are as controversial as nanotechnology. Its proponents say it will change everything. Its detractors say it is the first step on humanity's path to self-destruction. So what's causing all the fuss? **By Nathan Taylor***

"An immediate consequence of the Faustian bargain in obtaining the great power of nanotechnology is that we run a grave risk — the risk that we might destroy the biosphere on which all life depends."

This is from Sun chief scientist Bill Joy's near-existentialist rant in an article for *Wired* magazine, entitled 'Why the future doesn't need us'. He pitches the development of self-replicating machines as a gamble on human continuity. He also recognises that the rewards could be immense.

Like genetic engineering, nanotechnology epitomises the two extremes of the technology argument. For some, nanotechnology represents infinite possibilities, a path to a new world, the kind of technology revolution that could relegate the industrial age to a minor footnote in history. Others see only its potential destructiveness.

Its pioneers imagine a time when nanoscopic robots can manipulate things on an atomic level. These robots would be able to self-replicate and build objects and structures, atom by atom, and even prepare planets for colonisation. They could be put in a person's bloodstream to hunt down and kill viruses and cancers. They could be used to make self-repairing and self-cleaning devices and to carry information directly to and from the human brain. It all sounds very science fiction, but this is the dream of the nanotechnology pioneers.

In contrast, critics imagine a dystopia in which we lose control of the devices built, or where terrorists and military organisations use the technology to kill more efficiently.

What is nanotechnology?

A nanometre is one-billionth of a metre. An atom is about one-tenth of a nanometre (nm) across (or one angstrom). To use a

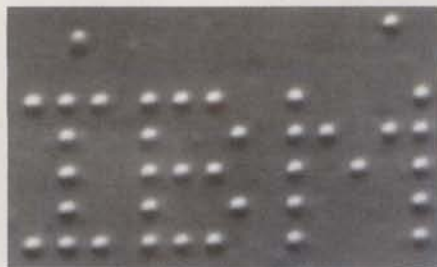
clichéd analogy, the width of a human hair is about 200,000nm. A red blood cell is approximately 10,000nm in diameter.

The definition of nanotechnology depends on who you talk to. Some recognise it as anything done on a nanometric scale. This could mean anything from processor lithography to cell biology.

However, the term is most commonly understood to mean the creation of devices at the atomic level. It's possible to build objects one atom at a time using modern technology. You might say it's the next step in micromachining, although it follows fundamentally different principles.

The beginnings of nanotechnology

Nanotechnology started to attract a lot of interest following a speech given by physicist and Nobel laureate Richard Feynman



▲ The exercise that opened the world's eyes to the possibility of atomic-level control of matter. This IBM logo was written with 35 individual Xenon atoms. Image courtesy of IBM.

at the annual meeting of the American Physical Society on December 29, 1959. This speech was entitled 'There's plenty of room at the bottom'.

Feynman recognised the possibility that manufacturing could be performed on an atomic scale. "The principles of physics, as far as I can see, do not speak against the possibility of manoeuvring things atom by atom," he said during the speech. "It is not an attempt to violate any laws. It is something, in principle, that can be done, but in practice, it has not been done because we are too big."

Showing considerable prescience, Feynman spoke of computers and their storage capacity, and pointed to a time when data storage would be practically infinite. "It turns out that all of the information that man has carefully accumulated in all the books in the world can be written in this form in a cube of material one two-hundredth of an inch wide, which is the barest piece of dust that can be made out by the human eye. So there is plenty of room at the bottom!"

At the time that this speech was delivered, human ability to move individual atoms was very limited. The best electron microscopes could only achieve a resolution of 10nm — about 100 atoms wide. However, in 1981 scientists at IBM's Zurich Research Laboratory invented a new type of electron microscope that allowed individual atoms to be not only visualised but also moved.

This invention, the scanning tunnelling microscope (STM), won two of its inventors, Gerd Binnig and Heinrich Rohrer, the Nobel Prize for Physics in 1986. In 1989 the potential of the STM was hammered home when IBM scientists formed the company's logo from 35 individual xenon atoms.

Several other types of device have been based on the STM; they are collectively known as scanning probe microscopes (SPMs). These include scanning near-field optical microscopes (SNOMs), which allow optical scanning to a resolution of 10 to

"We have yet to come to terms with the fact that the most compelling 21st-century technologies — robotics, genetic engineering, and nanotechnology — pose a different threat than the technologies that have come before. Specifically, robots, engineered organisms, and nanobots share a dangerous amplifying factor: they can self-replicate. A bomb is blown up only once, but one bot can become many, and quickly get out of control."

Bill Joy, Sun chief scientist, in *Wired*

50nm, and atomic force microscopes (AFMs) that can view mechanical properties of atomic force discharges.

SPMs are already being applied in experiments to create devices with atomic-level detail. Future processor, memory and hard disk systems may be created with such devices.

But the ideal is the nanomachine, nanometre-scale robots that take the workload from the SPM and start to build objects atom by atom — a process known as molecular manufacturing.

Nanomachines

Nanotechnology involves making machines very much like those used for manufacturing now, just on a much smaller scale. Prototype designs of nanoscopic machines have been produced for conveyor belts, robotic arms, miniature trucks and construction platforms. There have also been prototypes of simple computers to drive and organise these devices, and of energy sources to feed them.

Some less conventional modelling has been based on living systems. The way that living cells function is seen not only as proof that nanotechnology can work, but also as a system on which other devices can be replicated. In human cells, for instance, ribosomes (the constructors) read mRNA information (the computer) and build new cells based on that data.

Most works describe a bottom-up manufacturing process. In this process, objects are built atom by atom from a pool of raw materials. This method is often known as Drexlerian nanotechnology and is named for one of its pioneers and most outspoken advocates, Eric Drexler.

Applications

In his seminal work, *Engines of Creation*, Eric Drexler of the Institute of Molecular Manufacturing paints a picture of a

world without want or disease. He envisions manufacturing processes that cost no more than the raw materials, nanomachines that can heal at the cellular level and devices that can systematically repair or re-engineer environments. Many of the applications envisioned by Drexler and other nanotechnology pioneers have an air of the fantastic. However, as researchers are quick to point out, all of these things are feasible under physical laws as they are currently understood.

While Drexler's visions are far-sighted, others are looking at the near future and the development of new structures and systems with more immediate practical uses.

Manufacture

Molecular manufacturing lends itself to baseline production of just about any object. Atom by atom, it should be possible to build just about any structure, from children's fluffy toys to buildings and landscape features. Long-term thinkers even talk of 'utility fog' — amorphous masses that can reform themselves into various shapes as needed, kind of like the villain in *Terminator 2*.

One of the first goals of nanotechnology is to build new materials. The ultimate materials, according to Ralph Merkle of Zyvex (a nanotechnology startup), are diamondoid structures. The incredible strength to weight ratio of diamond makes it an ideal substance for anything from spaceships to furniture. For instance, planes or spaceships made of diamond could be up to 50 times lighter than aluminium ones.

Diamond is formed of a tightly bonded lattice of carbon molecules, normally created when carbon is subjected to great pressure. Using nanotechnology, it should be possible to build those bonds manually and make them less brittle than those found in natural diamond.

Buckyballs and buckytubes demonstrate the strength of carbon bonds. Buckytubes, made of bonded carbon, are at least 100 to 1,000 times stronger than steel.

With high positional control, it is thought to be possible to manufacture shatterproof diamond by moving carbon molecules around. Researchers see the development of the ability to do this as a priority.

Medicine

Combined with efforts like the Human Genome Project, nanotechnology may deliver atomic-level control of human cells. People could be engineered to exact specifications, hereditary diseases wiped out and life spans expanded dramatically — potentially, the aging process could be stopped. In *Nanomedicine*, author Robert A Freitas even explored the possibility of resurrection. "Nanotechnology will let us repair nonfunctioning tissue, leading us to re-examine the concept of clinical death used in medicine today," he said.

More immediate applications include highly efficient vaccines. Drexler and Freitas predict 'hunt and destroy' nanoscale machines that could track down and eradicate harmful bacteria, viruses or cancers. They speak of rebuilding body parts from scratch and re-invigorating dead cells.

There's also discussion of interfacing directly with the human brain, of developing internal nanodevices that can enhance the human thought process or link it directly to external computers.

The environment

Drexler waxes lyrical about nanotechnology's ability to 'fix' the environment. He imagines antipollution nanorobots, which can reshape pollutants into more benign substances. He paints pictures of re-creating extinct species from strands of DNA.

He also writes of highly efficient solar cells that can be manufactured cheaply and provide enough energy for the world's population.

Then there's terraforming, a NASA initiative that it hopes will enable off-world colonisation. In this scenario, nanorobots are sent to other planets or moons and programmed to create an environment capable of sustaining human life.

Computers

Mainstream manufacturing techniques can etch 0.18-micron (180nm) paths in silicon-integrated circuits right now. Nanotechnology can potentially achieve much

"The prospect of nanotechnology and molecular manufacturing has this paradoxical effect. It makes certain scenarios — such as a mid-21st century world of poverty, or choking on pollution caused by massive accumulations of 20th century-style industry — seem very unlikely indeed. This is useful information in trying to understand our real situation and trying to make sensible plans for the future. And yet the range of new possibilities opened up is broader than we could have imagined before. On the negative side, one can imagine building engines of destruction capable of devastating the world as thoroughly as a nuclear war. On the positive side, one can imagine futures of stable peace with levels of health, wealth, and environmental quality beyond any historical precedent and beyond present expectations."

Eric Drexler of the Institute for Molecular Manufacturing
in Unbounding the Future

greater path definition, although a technical limit is reached at about 0.05 microns. At that point, the quantum physical effect of tunnelling kicks in (in which the exact position of an electron is indeterminate, so it might 'tunnel' through to points outside the designated paths).

However, according to Ralph Merkle, there are greater advantages to computers manufactured at the molecular level than small feature sizes. The ability to synthesise materials that are more conductive may lead to tremendous clock speed benefits.

Diamond can operate at heat levels about five times greater than silicon can before shorting, allowing higher clock speeds to be achieved. It also conducts heat better, making it easier to cool, and electrons move through it more quickly than they do through silicon. Theoretically, diamond doped with metals could be made that is 50 to 100 times more conductive than copper. In short: diamond is the ideal semiconductor, but right now we are unable to produce diamond chips inexpensively or reliably.

Drexler has also proposed an almost retrograde approach to future computing: mechanical computers. Drexler's design

Useful nanotechnology resources

We've only scratched the surface of the potential of nanotechnology here. The Web contains vast amount of nanotechnology information. Here are some sites to get you started.

- Zyvex, a nanotech startup, publishes many articles on the subject of nanotechnology, and links to many others:
www.zyvex.com/nano
- The Foresight Institute provides numerous papers on nanotechnology matters:
www.foresight.org
- The full text of Eric Drexler's *Unbounding the Future*:
www.foresight.org/UTF/Unbound_LBW/index.html
- The full text of *Nanomedicine* by Robert A Freitas:
www.nanomedicine.com
- The transcript of Richard Feynman's original talk:
www.zyvex.com/nanotech/feynman.html
- Nanospot provides a searchable index of nanotechnology stories on the Web:
www.nanospot.org
- This is not to be confused with Nanodot, a Slashdot-like news service for nanotechnology:
www.nanodot.org
- Bill Joy's article in *Wired*:
www.wired.com/wired/archive/8.04/joy.html

for a mechanical transistor involves a simple pulley mechanism that blocks a mechanical 'punch' unless the right conditions are met.

Self-replication and assembly

Assembly is the biggest stumbling block for nanotechnology. Even the most basic tools will require millions of atoms. Placement of those atoms using SPMs would be impractical; current SPMs take hours to place a few molecules, so it would take decades or even centuries to build one nanorobot, let alone billions of them. The most plausible solution to this problem is self-replication.

In 1980, NASA produced a report on the feasibility of off-world colonisation. Automated, self-replicating systems were considered crucial to such endeavours. "From the human standpoint, perhaps the most exciting consequence of self-replicating systems is that they provide a means for organising potentially infinite quantities of matter," the report states. "This mass could be organised so as to produce an ever-widening habitat for man throughout the solar system."

Research into self-replication began in the late 1940s, when mathematician and physicist John von Neumann put together some of the earliest theoretical frameworks for self-replicating systems. Neumann's proposal was incredibly simple. A self-replicating system need only consist of two parts: a universal computer and a universal constructor. The former performs the direction, the latter the grunt work.

In this scenario, the universal computer directs the universal constructor in building another universal constructor and computer. The contents of the computer are then copied over, and the new device starts building another device like itself, eventuating in an exponential growth in the number of devices available. These devices could then be put to work on other projects by reprogramming the computer. The constructor (being universal) could work on any task directed by the computer.

Neumann built several frameworks for devices that would operate in 2D or 3D space. The most influential was the kinematic constructor, which modelled a system where a device could move materials in a 3D space.

Later, Drexler refined the architecture, specifying a system for moving individual atoms. Known as Drexler's assembler, it

added the ideas of tip chemistry and molecular positional capability to the design. These were practical additions for constructing devices at the molecular level. Proper positional control and management of molecular bonding (so molecules don't stick together when this is undesirable and do bond when needed) are works in progress. The tip chemistry places limits on the kinds of materials that are bonded.

At least three broad designs already exist for assemblers — devices capable of picking up single atoms and moving them around. Drexler's more recent book, *Nanosystems*, presents several of these designs.

The simplest is Drexler's stiff manipulator arm, a device about 100nm high and constructed of several million atoms. The arm is simple, and it has limitations. Later work focuses on the Stewart Platform, a design that should enable six degrees of freedom (x, y, z, roll, pitch, yaw), and fit in a space about 100nm wide. The design should require the placement of about three million individual atoms. Several variations on this design exist.

Drexler's design is often seen as the ultimate goal for nanotechnology, but in the meantime numerous research organisations are approaching molecular manufac-



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turing from different angles: conventional lithography, atomic collision and so on.

The theory goes that with these designs in place, we should be able to create more specific nanodevices. These general assemblers should be able to make copies of themselves and then be redirected to the creation of other devices.

It's generally recognised that the means of manufacturing and the device to be manufactured should be different. Not every nanodevice needs to be an assembler capable of self-replicating. While such devices are seen as essential for large-scale manufacturing, individual devices should be tailored to specific needs. Doing otherwise would be like buying the factory with the car.

In nanomedicine, for instance, nanotechnology designers are not promoting the injection of universal assemblers into human bodies. In fact, the Foresight Institute's guidelines forbid them to do so (see 'Dangers', page 91). Vaccines should be constructed outside the body and then injected.

Feasibility and time frame

One of the more startling aspects of nanotechnology development is the general acceptance of its inevitability. As Feynman pointed out in his original talk, none of the laws of physics are being broken. Accordingly, many researchers believe it is only a matter of time before applied science reaches the point where we can make nanoscopic machines cheaply and efficiently.

However, the time frame in which we can build self-replicating assemblers is anybody's guess. In 1995, *Wired* magazine ran a survey of some of the leading nanotechnology researchers, asking when they expected the technology to be available in specific areas like nanocomputing and cell repair. The answers ranged from 2000 to 2100.

Zyvex's Merkle extrapolates that, if the current technology miniaturisation track stays on course, we should be due for molecular manufacturing in the 2010 to 2020 timeframe. However, Merkle points out, extrapolating current trends is a poor way to predict future availability.

Most current work involves designs for devices that *should* work on a nano-scale, if only we had the means to construct them.

As yet, however, few of these designs have been realised, even in lab conditions. Numerous designs for gears, sleeves, bearings and other widgets are already stored in computer databases around the world, and even more ambitious designs like microscopic 'trucks' that are guided by

"Military applications of nanotechnology raise a number of concerns that prudence suggests we begin to investigate before, rather than after, we develop this new technology.

While molecular manufacturing will not arrive for many years, its obvious military potential will increasingly attract the interest of strategic planners. As it seems implausible that military applications of this technology will never be developed and deployed, it would seem safer to encourage the relatively early interest of those organizations less prone to the abuse of power and more likely to curb its abuse by others."

Ralph Merkle of Zyvex in *The MIT Technology Review*

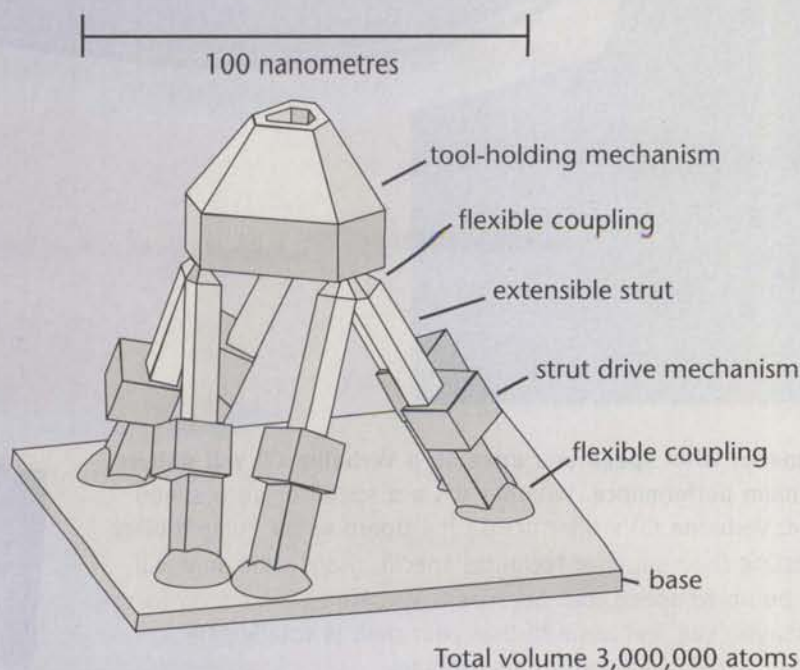
light signals have been computerised. But the practical ability to build such devices remains out of reach.

One of the most famous achievements is the construction of Cornell University's 1997 Nanoguitar, an instrument about 10,000 nanometres long. When the strings on the nanoguitar are plucked, they produce a noise at about 10MHz — way too high to be heard by humans. Of course, the amplitude of the sound is also too small to be audible.

More recent developments in the US have led to the creation of the 'nanobomb', originally developed by the University of Michigan to combat chemical warfare — in particular, anthrax. The droplets, only micrometres across, kill anthrax spores on contact with a remarkable success rate. It is believed that these can also be applied to other hostile chemicals and bacteria.

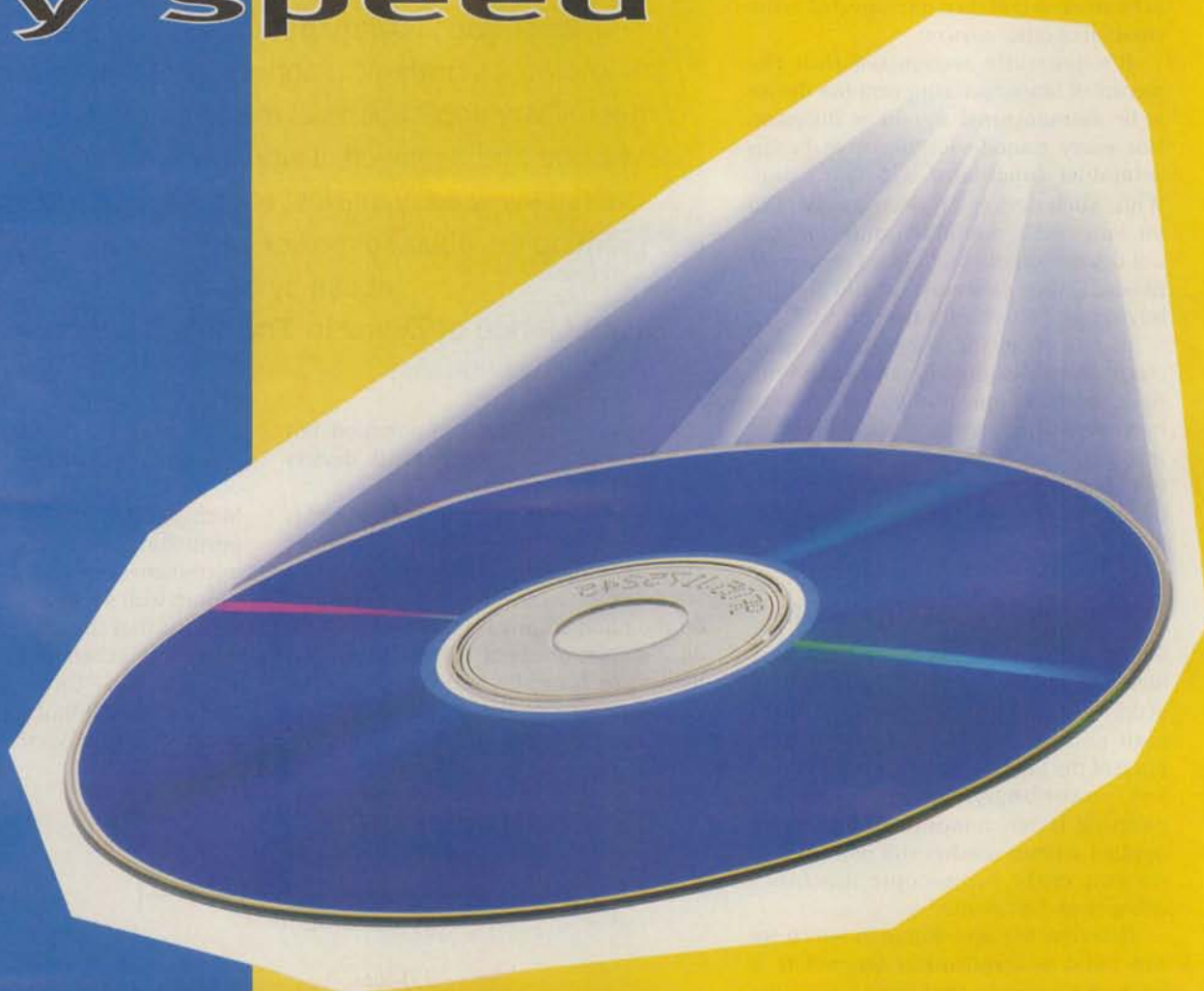
At Cornell University, a molecular motor was built that spun at three to four revolutions per second for 40 minutes. In

The Stewart Platform



▲ The Stewart Platform is an advanced nanomachine designed to move atoms with six degrees of freedom.

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future, these devices might be used as nano-scale pumps.

The technology is not without its doubters. At a nanoscience conference in June this year, Stanford University researcher Steven Block claimed nanotechnology spruikers like Drexler were getting ahead of themselves, promoting a technology that will not be feasible for a long time. Similarly, in a recent article in *The Standard*, Xerox Parc director John Seely Brown points out that "no-one . . . has laid out a route from lab-based simulation to practical systems in any detail".

The US Government is obviously hoping to accelerate the development of nanotechnology. On January 21, US President Bill Clinton announced the National Nanotechnology Initiative, a \$US495 million fund to promote the development of practical systems. All of the funding went to government organisations, including the National Science Foundation, the Department of Defence, NASA and the Department of Energy.

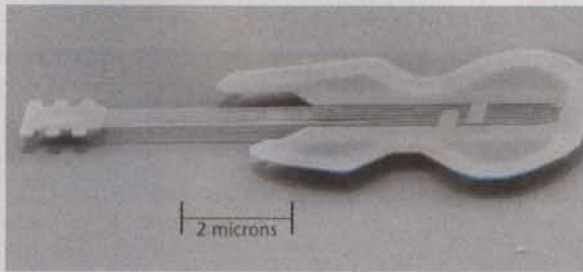
Taking a different approach, the Foresight Institute (a collective that is attempting to promote and organise efforts in nanotechnology) awards an annual prize for theoretical developments in nanotechnology, and has put up a grand prize of \$250,000 for the first organisation or university to build a working assembler and associated nanocomputer. The prize has stood since 1995, and has yet to be claimed.

Dangers

There may be few who doubt the feasibility of the technology, but there is a growing chorus of people who question its ability to make the world a better place. Joy, whose quote opened this article, is just one of many to fear the potential negative applications of the technology. Even its greatest proponents recognise the dangers inherent in developing the technology, although not all are as sceptical as Joy.

In a response to Joy's article, Xerox Parc's John Seely Brown and the University of California's Paul Duguid argue that he makes the false presumption that the technology will somehow get beyond human control. "Several of the steps Joy asks us to take — the leap from genetic engineering to a 'white plague'; from simulations to out-of-control nanotechnology; from replicating peptides to a 'robot species' — are extremely large, and they are certainly not steps that will be taken without diversions, regulations or controls," they argued in an article in *The Standard*.

The Foresight Institute was started as a means to self-regulate the development of future technologies, specifically nanotechnology. It is made up of some of the



▲ Cornell University's Nanoguitar, an instrument just 10 microns (10,000nm) long, which is approximately 1/20th of the diameter of a human hair. Each string on the guitar is only about 100 atoms wide. Image courtesy of Cornell University.

US's most prominent nanotechnology researchers and theorists.

In June this year, the institute released a revised set of guidelines for the development of nanotechnology. The guidelines are rather laissez-faire, promoting unrestricted but responsible access to the technology.

Many of the guidelines appear to be seeking to alleviate the fear surrounding what Drexler described as the "Star Trek Scenario", named for an episode of the series in which runaway 'nanites' caused problems for the crew of the *Enterprise*. This vision of the systems escaping into the wild and developing a will of their own is

a common theme in science fiction.

Drexler calls the notion of such events "absurd"; why, he asks, would the scientific community build something with the potential to mutate and self-sustain in the wild? Drexler's concerns centre on the use of nanotechnology for military purposes — a new kind of chemical warfare.

For instance, it's theoretically possible to build a device that targets only people

with the genetic marks of a particular race, or appears as some other kind of toxin. Nanotechnology could be added to the same set of treaties that govern the development of chemical, biological and nuclear systems.

This would not be surprising, given the way most discourse surrounding nanotechnology mirrors discussions of yesteryear about nuclear technology. Are we wandering blind into a minefield? Will we lose control? Who will have the power?

Whatever the ethics, one thing seems almost certain: nanotechnology will happen. **APC**

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Before reviewing digital cameras, APC has always asked around for industry views. 'It'll get much cheaper,' they chorused a couple of years ago, but they were wrong. Digital cameras have not slumped in price the way the pundits predicted, despite rocketing sales over the past year. Prices have remained static over the past two years in the vital mid-range sector, but at either end — semi-professional and plastic fantastic cheapo — there has been a noticeable fall in the median price.

The quality of digital cameras has definitely improved. Dramatically better lenses, vast increases in pixel count, faster operation and much better design have contributed to better overall value. Although prices for mid-range cameras haven't dropped, anecdotal evidence from retailers suggests that sales in this sector are healthy.

If lower prices aren't driving the camera boom, what is? It would seem that the Internet is to blame — as usual. Taking shots and immediately sharing them with friends via email has to be one of the most popular aspects of digital photography, followed closely by inhouse vertical uses such as DTP production, real estate and insurance image fast-tracking.

The few attempts to lower prices with cheap point-and-shoot cameras have been dismal failures. Sega, Ixla, Nintendo and others have tried and failed, mainly because the image quality was so poor. Consequently, most of the cameras APC looked at for these reviews fall into the \$750 to \$2,000 bracket,

and offer a minimum one megapixel quality, and up to three megapixels as a maximum.

Distributors were asked to supply APC with no more than two cameras; they could be in any price range, but we asked distributors to select models that best defined their new markets. Interestingly, Canon and Kodak have moved away from the speeds and feeds chase to make products which have better performance, rather than just more complex functions.

What you need

Most people look for a digital camera that is of high quality, easy to use and has long



Snap happy

*Snap, download, share. That's the sound of a digital camera being used. They're getting cheaper, better and faster than ever, and as usual APC is here to test the best. **Jeremy Torr** polishes his lens and checks out some snappy mid-range tackle.*

battery life. Battery life is still a bugbear, and all makers apart from Sony opt for a switchable LCD viewer to keep battery drain to a minimum. Sony provides a very large battery instead. In many cases, alkalines are supplied as standard, but it's worth buying some NiMH or Lilon rechargables when you buy the camera.

Some cameras tempt people with extras such as sound and MPEG movies, but these are not of particularly good quality (MPEG-1) and are more a gimmick than a useful tool. Remember also that digital zooms are attractive on paper, but the image quality is inevitably degraded at extreme zooms. Likewise, interpolated high-rating pixel counts (like Agfa's PhotoGenie) always concede some quality to pure optical pixel ratings.

The introduction of USB as the connection of choice is a welcome change this year, and has enabled a dramatic leap in image download speeds. However, during the course of our reviews we encountered USB driver installation routines that varied from very good (Sony) to the frustratingly awful (Ricoh). If you already have a USB or TWAIN scanner on your system, it is likely to cause even more headaches, so the option of an additional serial connection might be worth taking up.

Farewell film

Are the latest digital cameras worth buying? On a cost per shot basis, they probably aren't, especially when you consider the extra equipment (PC,

printer, photo paper) needed. However, the appeal of digital photography is being able to take a shot, see it immediately, and either store or delete it. You can also shoot again and again and never have to bother about buying, storing or developing film. Other advantages of digital photography include the potential to manipulate the images into the perfect shot, and the ability to send snaps immediately over the Internet.

The ever-increasing quality of digital cameras suggests that film's days numbered. If you are looking for a replacement for that venerable SLR, then a digital camera is well worth considering. If you want a throwaway for the weekend, or a poster-sized shot of the dog, film might still have the edge, but not for too much longer.

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Agfa ePhoto CL30

The Agfa CL30 is not the prettiest camera around, but it works well and it's cheap. For just over \$750 you get decent megapixel quality, one of the easiest to use control sets, a decent software download package, a tasty pouch to carry it in, and even a useful manual.

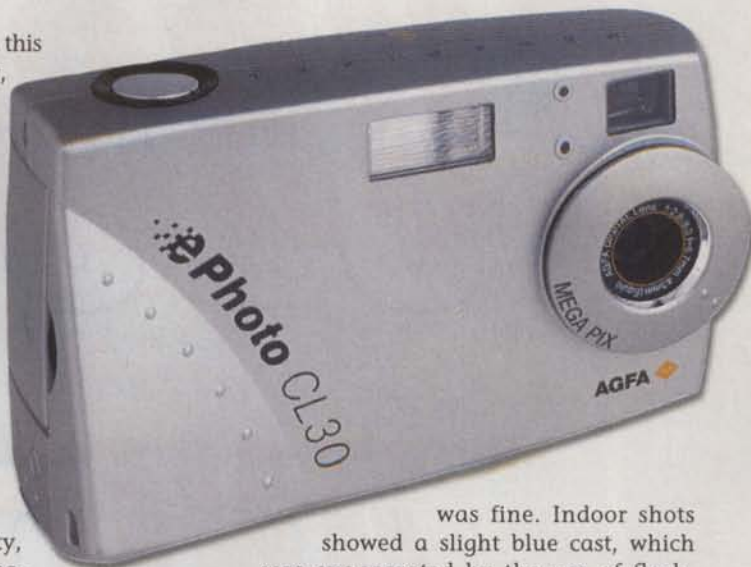
The camera is angular and chunky, and has a cast alloy casing which should be long-lasting. The controls are very simple: a shutter button on the top panel, two mode slider switches by the back panel LCD screen, and an EasyPilot scroll and click wheel under the viewfinder. Four AA alkaline batteries hide under the base, and a rather paltry 4M CompactFlash card slots under the end flap which also covers the USB, serial and TV sockets. A power socket is also fitted.

The fixed-length 43mm, f 2.8 lens uses a fast autofocus mechanism, but it made lots of grunting and whirring noises in our tests. It's switched on by flipping a control slider to either Play or Record, then you just point and shoot. Another slider enables either image viewing on the LCD, or the PC connect mode.

The warm-up time was average at five seconds, but the refresh time between shots was 12 seconds, so don't expect rapid

action shooting with this camera. However, once the images were captured, they raced down the USB connection at an astonishingly fast two seconds for a 1M file. Image expansion into the competent but unexciting Agfa PhotoGenie software package took another five seconds.

Setting the non-default parameters such as image quality, exposure compensation, white balance or flash type was much easier than for most of the competition, using a simple scroll and press sequence from the EasyPilot button. Once downloaded, the images were reasonable, given the price and maximum resolution of the camera. The images had good colour depth and shadow detail, but they started to show some obvious jaggies if enlarged by more than 100%. However, below that, the imaging



was fine. Indoor shots showed a slight blue cast, which was exaggerated by the use of flash. Overall, it's not bad for its price, if you can cope with its quaint styling.

Contact Agfa

Phone (03) 9264 7711

Online www.agfa.com.au

Price \$769

In short Not bad value, but its slow refresh and lack of zoom might knock it off our list.

Canon Digital IXUS

If you want to look cool, this is the device for you. It is slightly smaller than a pack of cigarettes and weighs only 190g, including its rechargeable LiIon battery. It dangles off its wrist strap like a piece of exotic jewellery. Luckily, there is plenty of substance there too, under the brushed alloy and stainless steel casing. A 2.11 megapixel CCD captures images via a tiny metal-barrelled 35 to 70mm zoom lens with an f2.8 maximum aperture, and the slightly smaller than average 1.5in LCD viewer has good clarity.

Due to its tiny size, the controls are restricted to a power button, a zoom/magnify lever, and a record/play slider. The back panel also has a minuscule set of four buttons to control menu selection, flash, macro, zone focus and so on. The 680mAh battery takes up almost half the case, leaving just enough room to squeeze in the 8M CompactFlash card and a universal connection that outputs TV and USB data.

There is no LCD status panel, but the IXUS obligingly flashes up understandable status icons on the viewing screen before shooting. The zoom action was one of the smoothest and fastest of the bunch, notably better than the Kodak or Ricoh cameras.

Bearing in mind the target market, the option list is reasonable, but if you want the same degree of image control as the Coolpix 990, forget it. White balance, exposure and quality can be altered, or you can switch to monochrome shots. Otherwise, it's auto all the way.

The image quality was surprisingly good. The camera provided very smooth detail with minimal jaggies, but with less shadow detail than some. Highlights were excellent.

Canon also seems to have banished its indoor flash coldness, and the IXUS produced very neutral results. Images had a greenish overall hue if no flash was used.

The most impressive feature of the IXUS is its operating speed. It was ready two seconds after switching on, including the unfurling of the lens from the front panel. It only required two seconds to refresh after each shot, and downloading an image over the simple USB connection into Canon's ZoomBrowser also took only two seconds for a 650K image.

The battery lasted about an hour



before needing a recharge, but it might be hard to replace if you travel. The software is acceptable, but it could be improved. However, considering its size, this camera is still a surprisingly competent device.

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Online www.canon.com.au

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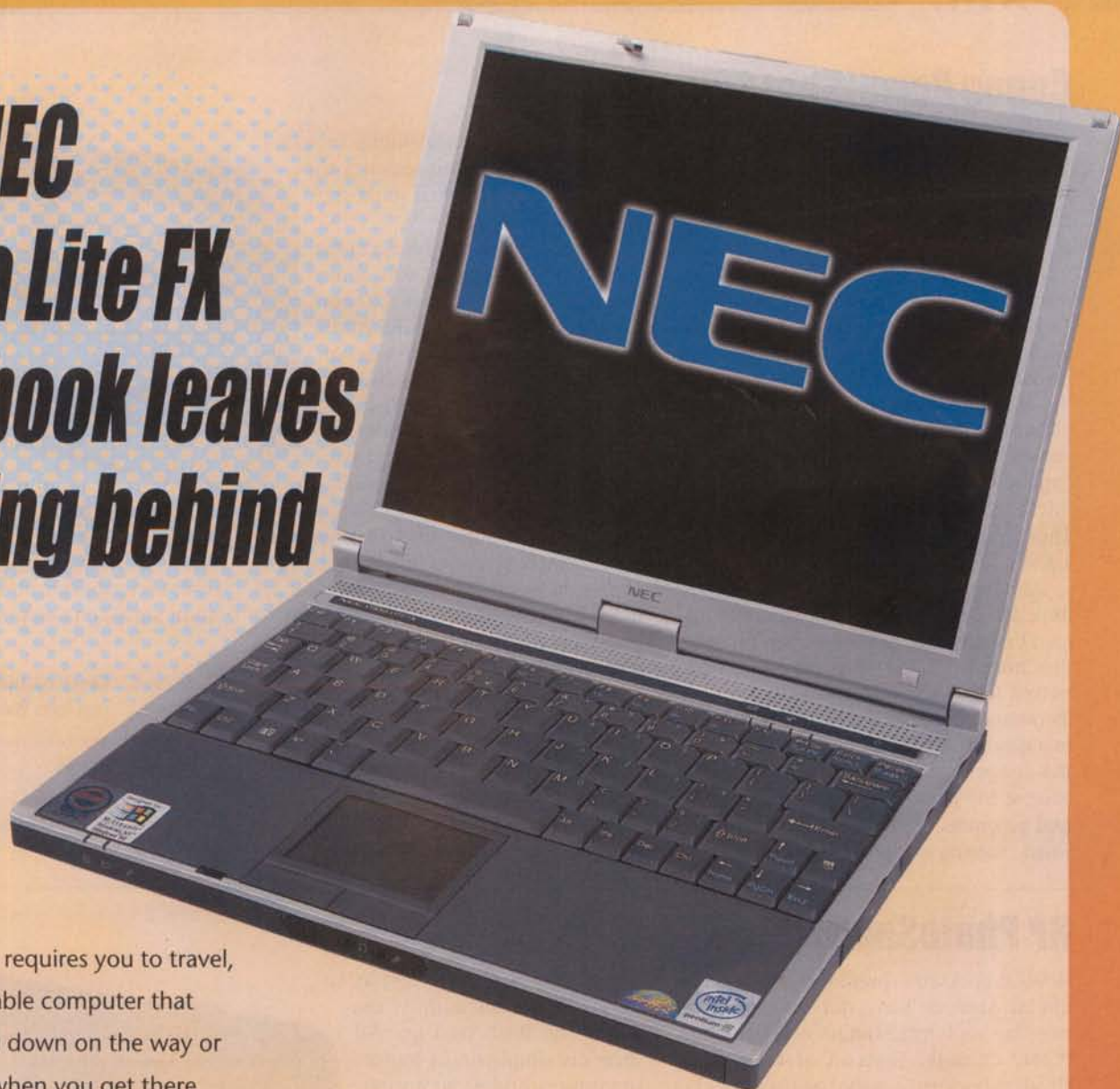
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Canon PowerShot S20

Based on the successful A Series compact digitals, Canon's new S Series has the same smooth brushed alloy casing, top-mounted mode dial, top-panel LCD and rear-mounted toggle switch as its predecessors. If it wasn't for the badge, it would be easy to mistake this camera for an A5 or A50.

However, the new series has much more go than its predecessors. It has a 3.3 megapixel CCD, a 2x zoom lens with digital 4x on top of that, a USB connector and a Type II CompactFlash slot. The camera comes with a 16M card, but the Type II capability means it's happy to take IBM's Microdrive with up to 340M capacity. That's plenty of pics, even at 2,048 by 1,536 resolution.

Although it has plenty of control buttons, the PowerShot S20's image options aren't much more extensive than those of the Canon IXUS. The top-panel controls are backed up by six scattered buttons and a toggle/zoom dial which all make adjustments rather laborious. One useful extra is the Image option on the mode dial. This extends the plain auto or manual modes, and programs the camera for best results when shooting at night, or when using fast

action, landscape, slow shutter or mono options. It also complements the 'stitch' mode which offers multi-shot panorama shooting.

The clarity and brightness of the 1.8in LCD viewer was well above average. The PowerShot S20 can use either the supplied 2CR5 NiMH battery or a disposable lithium battery, and the bundle includes a direct power supply as well as the charger — invaluable for slideshow evenings. Output is achieved via a combined USB/serial socket or through a separate TV-out socket.

Canon obviously likes fast cameras. Like the IXUS, it sprang into life in two seconds, and was ready for a second shot 2.3 seconds after the first. Downloading was even zippier, at a little over 1.5 seconds for a 750K image.

Canon has included Adobe Photo-Deluxe as well the ZoomBrowser download utility with the S20, and the resulting images are great. It provided very high detail and minimal jaggies at up to 200% zoom. It had better shadow detail than the Nikon Coolpix 990, but slightly less high-



light accuracy and some associated bleaching. Nonetheless, the overall image quality was excellent, and indoor flash shots happily took 300% enlargement with no jaggies or colour cast. At \$200 less than the Nikon Coolpix 990, it's a steal.

Contact Canon Australia
Phone (02) 9805 2000
Online www.canon.com.au
Price \$1,899
In short It's rugged and fast, with a 3.3 megapixel CCD and is reasonably priced.

HP PhotoSmart C500

Hewlett-Packard's previous efforts with digital cameras have not been impressive, but its latest product marks a dramatic change. Instead of reflecting Hewlett-Packard's usual simple, click-happy design approach, the PhotoSmart C500's capability and controls are almost overwhelming.

It has an LCD status panel on top, as well as power, flash, quality, IR share and a four-way thumbwheel mode control. The back panel has zoom, a multi-way toggle control, menu-on and overlay buttons, LCD control, three extra menu context-sensitive soft buttons and three status LEDs. That's a lot of stuff.

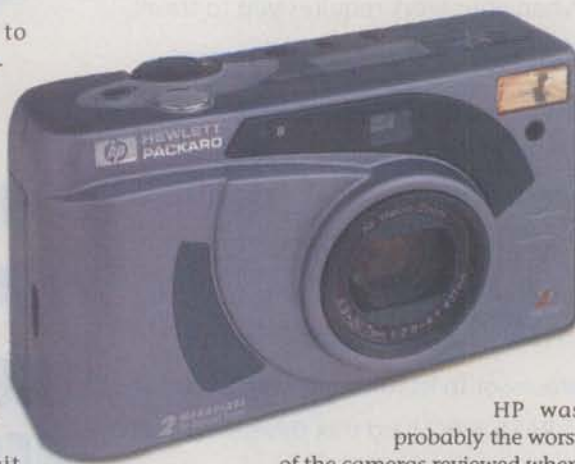
The body is quite bulky, with a pop-out 38 to 115mm macro zoom, viewfinder and built-in flash on the front, card slot on the right, and connection sockets on the left. The bottom contains a button battery for date backup and the main battery housing, which holds the three AA NiMH rechargeables. A USB and a serial cable are supplied, as is a battery charger and a CD with Digita Desktop, Ulead PhotoImpact and PhotoExplorer plus Hewlett-Packard's camera link software. Full marks for a generous and competent package.

The camera is easy to use, despite all those controls. Switch it on (this took us

about five seconds), set it to record, adjust the quality, configure the flash and go. All these are simple single-button procedures, and if you want to delve deeper and set things like white balance or exposure weighting, then its onscreen menus are equally understandable. Shooting options include still, time lapse and burst. A mystery 'eye-activated' option also appears, but is not mentioned in the manual.

APC found the zoom a bit ratchety and noisy, and the LCD viewer jerked noticeably when panning fast. Its shot refresh time was good at four seconds, but in burst mode it seemed reluctant to take more than two images at a time. The images were very good once downloaded at a sizzling 3.5 seconds (for a 450K image) into the excellent Photo Explorer. Even though it had a few more jaggies than some cameras, it had excellent detail, colour depth and range across shadow and highlights.

On the downside, when we downloaded a few shots from the 16M CompactFlash card, the battery icon started flashing. The



HP was probably the worst of the cameras reviewed when it came to battery life, even with its high power NiMHs. Overall, it's a capable camera for the money. It has a good mix of features, is easy to use, has excellent software and decent quality imaging, but its battery life is poor.

Contact Hewlett-Packard
Phone 13 13 47
Online www.hp.com.au
Price \$1,239
In short Decent quality, fast and well designed, but fries batteries.

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Kodak DC4800

On first inspection, this device looks more like a WW I tank than a camera. The bulbous titanium alloy handgrip and protruding lens barrel give it a very utilitarian appearance.

The camera includes a three megapixel CCD, a 28 to 84mm autofocus optical zoom lens with a 43mm filter mount on the front, and a thumbwheel on top to control the operating mode.

It also has some unusual extra controls that Kodak has included to make the camera more like a sophisticated film compact. These include an exposure compensation dial on the top panel, an f stop adjuster around the on/off switch and a menu system that allows you to quickly dial in monochrome or coloured filters. You can also select 'film speed' ISO ratings to suit different subjects such as action, landscapes or bright-light shooting.

Despite all this extra sophistication, it isn't hard to use, especially if you set it to program mode. The top panel houses a status LCD, the shutter and the mode dial, and also hides a pop-up user-selectable flash. The connection sockets all hide under a flap at the left-hand end, and the D-shaped KLIC LiIon battery and 16M CompactFlash card sit inside the hand-

grip. A separate charger is included in the box. The back panel has few controls, just two buttons for OK and menu, and a four-way toggle control for selecting from a sizable array of icon-labelled menu choices. The top panel has dedicated buttons for a flash, zone focus and timer.

No software was supplied with the pre-production review model, but USB is standard. Images downloaded via a CompactFlash card reader showed beautifully smooth overall rendition, but with slightly less shadow detail than some of the other cameras. Highlights and details were excellent, as were colour balance and accuracy. Enlarging the images by up to 300% was no problem, and there was not a jaggy to be seen. The flash introduced a slight yellowish cast, but the built-in ability to select filters and exposure rating means this can be corrected.

One problem we encountered was the zoom — it moved so fast it was hard to zone accurately. The startup speed was average at three seconds, but refresh was sluggish at seven seconds.



As an innovative departure from the camera/photolab tradition of creative artistic images, this camera should earn some high praise from the amateur photographer and casual snapper alike.

Contact Kodak

Phone 1300 130 674

Online www.kodak.com.au

Price \$1,999

In short This camera is very versatile and easy to use. It has sophisticated features and excellent image capabilities.

Kodak DC5000

Kodak has taken a leap into the unknown with its new DC5000. Unlike most of the competition, it comes with hefty rubber grips, water-resistant seals, big chunky controls and a totally sealed zoom lens mechanism. This makes the camera bigger and heavier than most, but also makes it ideal for use in industrial or action situations.

All the controls are either simple rotating dial switches or chunky buttons. Coupled with the tried and true Kodak icon-driven menu system, they are very easy to use. A secondary cover on the left houses the 8M CompactFlash card, the USB/serial socket and a video-out socket, and four AA batteries hide in the base.

Switching on the camera warms up the zoom, and basic status details are provided by the top-mounted LCD. Surprisingly, battery capacity isn't displayed until a shot is taken. The non-retractable lens housing offers a standard 37mm screw mount on the front for any filters or special lenses. Flash, macro, focus, exposure metering and zoom settings are simple to operate. The only problem is the lack of options for setting picture quality; you can only select from high or standard.

The autofocus was fast and accurate even in low light. The zoom was also fast, but the 30 to 60mm equivalent optical zoom range wasn't as wide as it might have been. Digital zoom extends this by 6x. The power-up and refresh speeds were reasonably fast at three seconds and five seconds respectively. A quick preview/erase is also included, and the flash gave decent fill without over-blueing.

The built-in 1.8in viewing screen provided a quality image in most conditions, and has a brightness control for gloomy conditions. The ArcSoft PhotoImpressions 2000 software is useful, but not as effective as the previous Kodak software, and is limited to downloading two images at a time. It took about six seconds to download a 400K image with USB.

Outdoor resolution wasn't as crisp as for some other cameras, as there were visibly bleached highlights, but its colour tones were quite good overall. Using the



flash indoors produced very good overall quality, but switching it off resulted in resolution degradation and muddier colours.

Contact Kodak

Phone 1300 130 674

Online www.kodak.com.au

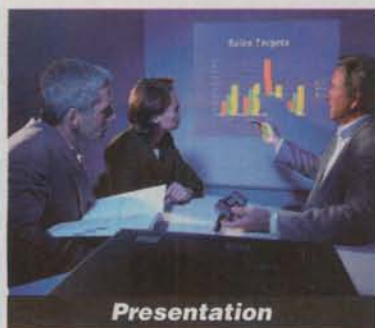
Price \$1,349

In short Tough, with good quality optics and decent images. Not the most dainty camera, but definitely the most rugged.

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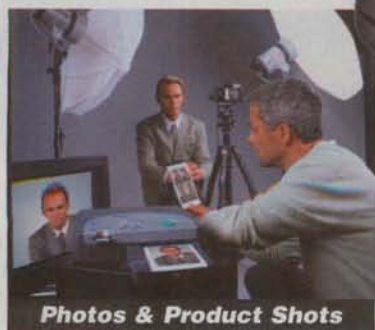
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Nikon Coolpix 800

Nikon's Coolpix 800 might look like a kiddie camera, but it is a very capable two megapixel zoom camera, with lots of decent features and a well-designed control system.

A black plastic case holds the 38 to 76mm f3.5 zoom lens, a coupled viewfinder and built-in flash, a simple mode dial and LCD on the top panel, along with a set of four one-touch shooting control buttons. The slightly fiddly menu system (you use the zoom buttons to page up or down the options) allow you to adjust metering, exposure and other functions. The camera automatically drops into file exchange mode when the serial connector cord is plugged in. Four AA alkalines sit in the chunky hand grip, and an 8M CompactFlash card hides in a slot on the bottom.

Like most other cameras, the viewing screen can be switched on for picture composition. This is useful, because the viewfinder is irritatingly small and awkwardly placed. Likewise, the zoom buttons are too small and hard to access. All of the other controls are logical and well laid out, and very similar to any compact film camera.

The viewing screen isn't as bright as some, but it has more detail. The camera whirled when switched on, and was ready

for use in 3.5 seconds. Unusually, the autofocus system works constantly, even when a finger isn't on the shutter. This speeds up the photo-taking process, but it drains the batteries. Perhaps to make up for this, the autosleep function cuts in after only 30 seconds with the LCD viewer switched on.

Provision is made for manual focus, white balance, exposure, metering and other adjustments. Three quality levels and raw data format are available, with a five-second refresh at best compressed quality. The unit APC reviewed came with the NikonView download utility, which accesses the camera as a disk drive within Windows Explorer.

The lack of USB showed in the connection times. It took one minute and 22 seconds for a 700K image to grind across the supplied cable. Surprisingly, the high-quality image was almost twice the size of a similar Kodak DC5000 shot, but the detail wasn't noticeably better. The tones were smoother, but the difference was hard to spot and the colour had less depth.



Using the flash indoors produced superb results, with excellent colouration and detail. Overall, the Coolpix 800 is a good-value and effective unit, but Nikon needs to work on the design to make it look like it's worth the money.

Contact Nikon
Phone (02) 9390 0200
Online www.nikon.com
Price \$1,349

In short Good range of facilities and quality in a pocket-sized package.

Nikon Coolpix 990

The Nikon Coolpix 990 is a very good digital camera. Image quality from the 3.1 megapixel CCD, using the f2.5 zoom lens, was truly impressive. Terrific resolution (even at 250% magnification), smooth tones and precise detail, make this a quality unit. Admittedly, detail tends to tail off slightly in the deeper shadow areas, but that's being rather picky.

The Coolpix 990 looks a bit like a grown-up 800, and has a swivelling lens and flash head on the left side of the body. This area also contains the viewfinder, the autofocus mechanism and the exposure sensors. The main body holds the LCD viewer, the controls and the shutter grip. The power comes from four AA alkalines, and a 16M CompactFlash card slots into the case under the USB and TV-out sockets. The mode thumbwheel is virtually the same as on the Coolpix 800, and the back panel and basic option buttons around the edge of the LCD viewer are also similar.

Extras include a four-way menu-sensitive toggle control, and a rotating wheel for setting custom variables. Using the camera is easy if you don't want to delve into the high-level controls. The

top-panel readout LCD gives excellent status feedback, and you can just set everything to auto and shoot.

If you like tinkering, there is plenty to tinker with: aperture, speed, zoom action, metering mode, burst mode, program, aperture or shutter priority, auto best shot selector, focus mode, sharpness, auto exposure bracketing and more can all be quickly and easily adjusted using the thumbwheel.

Its startup speed was reasonable at three seconds, and the refresh between shots was fair at 5.5 seconds at the 'fine' image setting. The pre-production CD APC received included a USB version of NikonView 3.0, but this didn't recognise the camera, so we used serial instead and got download times of about one minute and 50 seconds for a 1M file. USB would obviously be faster.

Indoor shots were very good, and the non-flashed images had almost as good



definition as the flash ones (without the latter's cold cast). Unlike the Coolpix 800, the 990 switched its autofocus off when it wasn't getting ready to shoot, but that didn't stop it being a battery hog. The Coolpix 990 is an excellent piece of equipment. It's good for snapping, but it's just as adjustable as a semi-professional SLR.

Contact Nikon
Phone (02) 9390 0200
Online www.nikon.com
Price \$2,099

In short Don't mind the design; this camera is a beauty.



It'll work
even when
your fingers
don't.



Introducing the new **KODAK DC5000**: the digital camera that's ideal for people who have to take shots in less than ideal conditions.

It has a weatherproof hard-shell and rubber body. Oversized controls designed for gloves and numb fingers. And a straightforward operating system with nothing fiddly to get in the way when the pressure's on. Of course, beneath our DC5000's rugged exterior lies a lot of impressive features.

Like a 2x optical zoom lens, 2-Megapixel resolution for stunning 8 x 10 prints and auto-focus and auto-flash.

So, if you need to take a camera to places ordinary cameras don't like to go, take a look at the new **KODAK DC5000**.



DC280



DC290



DC4800

Whatever your application, Kodak has the digital camera for you

For more information, call 1300 130 674 or visit www.kodak.com/go/dc5000

Olympus C-3030 Zoom

The Olympus C-3030 Zoom is definitely the flagship model for Olympus. It has a three megapixel sensor, built-in MPEG movie capture, remote control, many operating modes and excellent image quality. It's also the most expensive of the cameras reviewed.

Enlargements to 400% using the indoor flash are possible, but outside shots with a lot of glare are slightly less accurate than the Kodak DC4800. Its colour accuracy was the best in all conditions, especially in shadow, but fine details became fuzzy in highlighted areas.

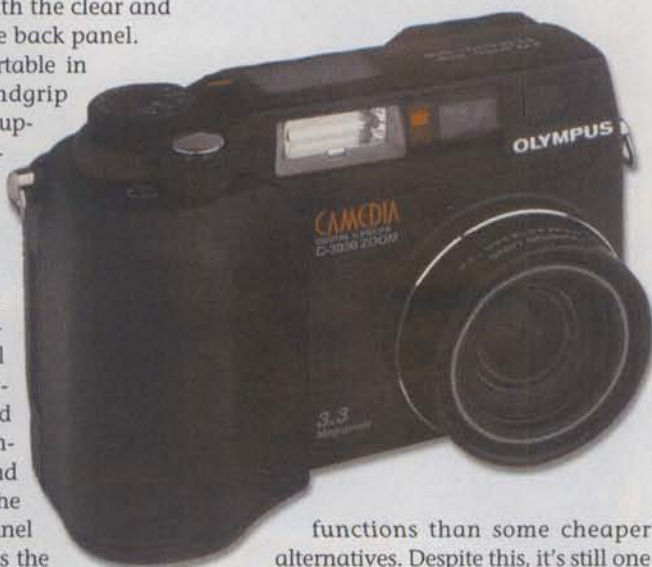
It took about seven seconds to download a 1M file over a USB connection, and its startup and refresh speeds were quick as well, at 2.5 seconds each.

Using the camera is straightforward, and the eight buttons (not including the mode wheel) tend to operate in batches for convenience. This isn't a dabbler's camera — you'll need to read the bulky manual. Once you have, the option to swap between aperture priority, shutter priority, manual, video or program modes and the option to totally tailor everything from film speed to metering to sharpness will delight the inveterate tinkerer. You can check whether all the

tinkering has paid off with the clear and bright LCD viewer on the back panel.

The camera is comfortable in the hand, and the handgrip accommodates the two supplied CR-V3 lithium disposable batteries (or four standard AAs if you prefer high-power rechargables). The autofocus zoom is quick and quiet in action, and is supplemented by a 2.5x digital zoom. The 16M SmartMedia card slips behind the handgrip, and the connections for USB, serial and TV sit under a flap on the left-hand side. The top-panel LCD isn't quite as busy as the Nikon Coolpix 990's, but it works well. Its overall design is initially unassuming, but the closer you look the better it seems. However, the slightly rattly zoom lens outer cover looks nowhere near as solid as those on the Canons.

The supplied Camedia software was probably the most difficult to install, requiring repeated directory hunting to locate the USB driver. It also has fewer



functions than some cheaper alternatives. Despite this, it's still one of the best consumer digitals around.

Contact R Gunz

Phone (02) 9935 6600

Online www.olympus.com

Price \$2,259

In short Everything but the kitchen sink is in the tiny case, and it all works.

Olympus C-860L

Designed to look and work much more like a conventional film camera than most of the competition, the Olympus C-860L is probably the most intuitive digital camera to use. Push back the lens cover/switch, press the big silver button on the top panel, and the photo's taken. To view images, press the green button next to the LCD viewer on the back panel, then press + or - to page through. All the controls are well labelled with understandable icons, and all this is backed up with a well-laid-out manual.

On the top panel are buttons for the menu, digital 2x zoom, timer and flash setting when in shooting mode. These duplicate multidisplay, image protect, printer and erase functions when viewing images. An 8M SmartMedia card hides under the handgrip, which also houses the four AA batteries supplied. Serial, TV and power-in sockets are under a rubber flap on the left-hand end of the body.

The camera was comfortable to hold and easy to use, but like many others it used a lot of power. Rechargeable batteries would be a good idea. The 36mm autofocus lens and 1.3 megapixel combination was fine for most snapping, and

combined with a digital zoom and a macro option, offered reasonable performance. The combination of digital zoom and image quality selection on the same button was irritating, and it resulted in frequent mistakes.

The camera was reasonably fast. It took two seconds to start, 3.5 seconds to refresh, but downloading was much slower because of the serial-only connection. It took 21 seconds to download a 190K high resolution image using the basic Camedia Master software.

For a point and snap unit, the options aren't too bad. Exposure, metering, white balance, ISO setting and panorama modes are all configurable. Image quality was good considering the pixel rating. Good definition and colour was available up to about 150% enlargement, but jaggies became evident at this point. Good shadow detail and saturation were obvious, but overall detail was slightly less than the Agfa ePhoto CL30. A flash was essential indoors. Without it, the image



lost detail and colour. Using the flash gave detailed, neutral results. All things considered, the C-860L is a well-balanced unit, but probably best for the snapper rather than the serious photographer.

Contact R Gunz

Phone (02) 9935 6600

Online www.olympus.com

Price \$899

In short Neat design and reasonable quality, but some extra software would be good.

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The Small Business Pocketbook is the essential technology guide to streamlining your business, and includes all the info you need to make your business GST compliant.



Ricoh RDC-5300

To describe the Ricoh RDC-5300 unit as functional-looking would be a compliment. It's chunky in an industrial sort of way. The boxy casing has mechanical shutters that cover both the lens and viewing screen. These hide a 2.3 megapixel CCD, 8M of very fast internal memory and an external SmartMedia expansion slot.

The central viewfinder would suit most people, and the mode wheel and shutter are also well placed. The top panel has a very small status LCD, and four single-action buttons for internal/external memory, flash, timer and image quality.

There are four quality modes, with varying sizes and compression to a maximum of 1,790 by 1,200. The back panel holds the control for the relatively slow and noisy zoom, the LCD and the power switch. A display on/off and two menu operation buttons sit below the LCD screen. The USB, TV and serial connectors and the SmartMedia card slot are positioned on the left-hand end, and four heavily worked AA alkalines fit inside the handgrip. A thumbwheel controls screen brightness.

The RDC-5300 was one of the fastest digital cameras, and had reasonable 4.5 second power up and a very rapid 1 second

refresh time. The LCD viewer was also quick to react, without the image framing lag seen on some of the other models. Despite this, it took some time to view previously taken shots. The onscreen menuing system was easily bettered by the likes of Kodak and Agfa, as its intensively textual approach and the up/down options on the zoom button made all the extra functions a chore to get at. It has a good range of options, and it has useful extras such as auto-bracketing across three exposures, time-lapse shooting and soft-focus mode, in addition to the usual program and manual options.

The supplied USB driver and ArcSoft software worked well, but have to be installed manually by delving in various directories, which is hardly user friendly. Image results after a five second download (of a 780K file) were good, with neutral tones and a very balanced compromise between detail and jaggies at up to 200% enlargement. There was some loss of high-light detail, but its shadow and midtones were as good as any. Indoor flash images



were smooth and warm with good detail across the range, but without the flash the shots looked decidedly muddy and blotchy.

When compared to the new models from Kodak and Canon, this model showed its age. It's competent, but relatively pricey.

Contact Ricoh

Phone (03) 9888 7722

Online www.ricoh.com

Price \$1,649

In short Decent specs and quality, but a bit dated in some respects.

Ricoh RDC-7

If the Canon Digital IXUS looks smooth, the Ricoh RDC-7 looks positively frictionless. More like a burnished cigar case than a camera, it is pocket-sized and has tiny, discreet controls. It is also very capable. It can capture three-megapixel stills, MPEG movies up to 30 seconds long and sound. A wide range of filters and effects are packed into the sleek body.

The 3x zoom was smooth and progressive in operation, and it had a decent range without the use of digital modification. The designers have cunningly added two shutter releases, so it can be used just as easily in vertical and horizontal modes.

The main control is the back-mounted mode dial, which selects between play, auto, sound, move, multi-image, text and setup. The power button is in the centre of this dial, and the zoom lever extends slightly beyond it, making it easy to locate the controls. The only other external controls are the dedicated buttons for timer, image quality, flash and memory access. This last is there because the RDC-7 comes with 8M of internal memory, but it can also take a SmartMedia card in the slot on the back panel.

The battery is the same as that of the Kodak DC4800; a rechargeable KLIC 3000 D-type. Output sockets and a power-in port sit on the end panel. Under a flap to one side of the tiny status LCD nestles a super-crisp LCD viewing and menu screen, complete with its own button panel for secondary functions such as paging through images, exposure adjustment, white balance, ISO setting, macro and so on.

This means you can just point and shoot with the screen closed, and access a very programmable unit with it open.

Its software includes a USB connect utility and ArcSoft image manipulation software. This was harder to install than the software of any other camera, and required a lot of backtracking and tinkering with CDs to get it working.

The camera's download time was 6.5 seconds for a 970K file via USB. The zoom was very smooth and progressive, and image clarity was good on the screen and viewfinder. The resulting images were not quite as good as equivalent Nikon and Olympus units, and there were noticeable



bleached highlights and loss of detail in shadows. Using the flash lifted the quality of indoor photos — shooting without the flash resulted in a muddy cast. If you need sound and video and cool looks, this is it. If you want pure quality, others have much more to offer.

Contact Ricoh

Phone (03) 9888 7722

Online www.ricoh.com

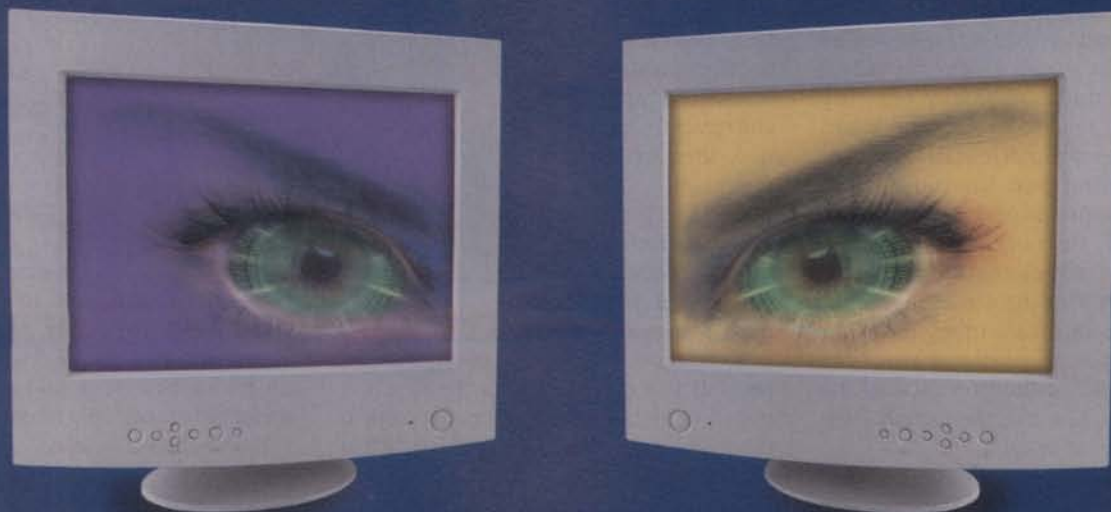
Price \$1,999

In short This camera has superb design and controls, but it lags slightly behind other triple-megapixel units when it comes to quality.

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- AGP-V7100/T : GeForce2 MX, VGA + TV-out, 32 MB/16 MB SDRAM
- AGP-V7100/PURE : GeForce2 MX, VGA , 32 MB/16 MB SDRAM
- And other combinations of dual display (depends on the request)



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- AGP-V7700 Deluxe : GeForce2 GTS, 32MB DDR, SGRAM, TV-out, Video-in, VR 3D glasses

- AGP-V7700 / T / 64MB: GeForce2 GTS, 64MB DDR, SDRAM, TV-out
- AGP-V7700 / T / 32MB: GeForce2 GTS, 32MB DDR, SGRAM, TV-out
- AGP-V7700 / 64MB: GeForce2 GTS, 64MB DDR, SDRAM, w/o SmartDoctor
- AGP-V7700 / 32MB: GeForce2 GTS, 32MB DDR, SGRAM

AGP-V3800 Magic Series



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- AGP-V3800 Magic: TNT2 M64, 32/16MB, SDRAM

AGP-V300C:



- SIS 305, 16MB, SDRAM



WWW.asus.com

Australia : NSW (02)9742 3288
QLD (07)3857 5969

VIC (03)9894 9899
WA (08)9445 9500

New Zealand : 0800 800 905

Sony Cyber-shot DSC-S50

The Sony Cyber-shot DSC-S50 is a little marvel that copes well with still images, MPEG video and sound, and completely does away with conventions like viewfinders and thumbwheel controls.

The squat device uses a rear-mounted LCD viewfinder panel which can swivel 360° vertically and horizontally, allowing overhead and reverse shots to be taken with ease. The top panel features two controls: the shutter and the play/record switch. A microphone and a speaker also sit on the top. The back panel houses a power switch, a toggle control that works in conjunction with the onscreen menus, and a set of dedicated buttons for focus, flash, and exposure program. These are much better placed than on most of the other cameras, but, like the Canon Digital IXUS, are a bit small.

The camera outputs through USB and AV sockets in the base, and the huge battery which powers the screen for well over one hour fits under the right panel. A 4M Memory Stick is fitted as standard, and it limits images to about three high-res shots, which is pathetic.

The extra-wide-range zoom works smoothly and produces good quality, even

when in the 3x digital range. A good range of shooting options is available, and it's easy to make changes to the program, aperture, speed, sharpness, negative, monochrome and so on.

The S50 powered up and ran very rapidly, taking 3.5 seconds to get going, and only 1.7 seconds to refresh between shots. The package comes with the simplest USB driver utility of the bunch; it installed faultlessly and dropped a camera drive icon into Windows Explorer. It's a shame the USB cable is ridiculously short. MGI PhotoSuite is also included, providing solid imaging capability.

The S50 images were extremely good for a two megapixel unit, and had warm colours, good shadow detail and only a little blocking on solid tones. The indoor flash was excellent, and enlargement of up to 200% was easily achieved with very



neutral tones all round. Add to this the short MPEG movie capability, which was adequate, and you get good value and quality for money. If it had a decent-sized memory to match the maximum 1,600 by 1,200 resolution, it would be perfect.

Contact Sony

Phone (02) 9878 9712

Online www.sony.com.au

Price \$1,469

In short Unpretentious, very capable and easy to use.



Kodak DC4800

Highly commended

Olympus C-3030

With the quality of digital cameras available now, it was difficult to pick a winner, but after consideration, the Kodak DC4800 took top honours. By not trying to be a digital do-it all, and just behaving like an ordinary, adjustable camera that also happens to take superb three megapixel shots, it squeaks in ahead of the Olympus C-3030 Zoom's bells and whistles approach.

These are not the only cameras worthy of mention. The brilliant Canon Digital IXUS knows its place — a fashion snapper — and does its job beautifully. An honourable mention must also go to the Agfa ePhoto CL30 which offers top value, and the Sony Cyber-shot DSC-S50, which easily walks away with the 'most gadgets per kilo' award.

How we tested

All cameras were reviewed as supplied by the distributors. The supplied connectivity and image management software was loaded onto a clean Gateway E1400 Celeron 466 using the instructions supplied. All units were tested either with a new set of alkalines, or rechargables as supplied in the box.

Consideration was given to how easy the cameras were to set up and use, to their size and weight, and to the arrangement of controls. A series of test images were shot outside on a moderately sunny day, and inside, both with and without the flash. The best results from each camera were selected as comparison shots.

All cameras were set to their highest possible resolution before shooting, and were used on standard auto mode both indoors and out. All shots were handheld. Outside scenery shots were set to the mid-zoom setting, and inside still-life shots to the widest possible zoom

without macro. No digital zoom options were used.

During testing, battery life, speed of operation, ease of changing settings, supplied standard memory and the overall range of functions available were compared. Lens specs were given as 35mm equivalent, not actual (for instance, 35 to 70mm is actually 5.4 to 10.8mm).

To download images, the fastest host connections possible were used: USB if available, serial if not. Images were viewed in a photo editing package on a 19in Philips flat-screen monitor at normal and up to 300% zoom, and compared for overall quality, tonal accuracy and colour balance. Note was also made of detail rendition at high levels of zoom, and for the onset of jaggies (pixelation).

Lastly, consideration was given to cost, and to the comparative overall value of the units.



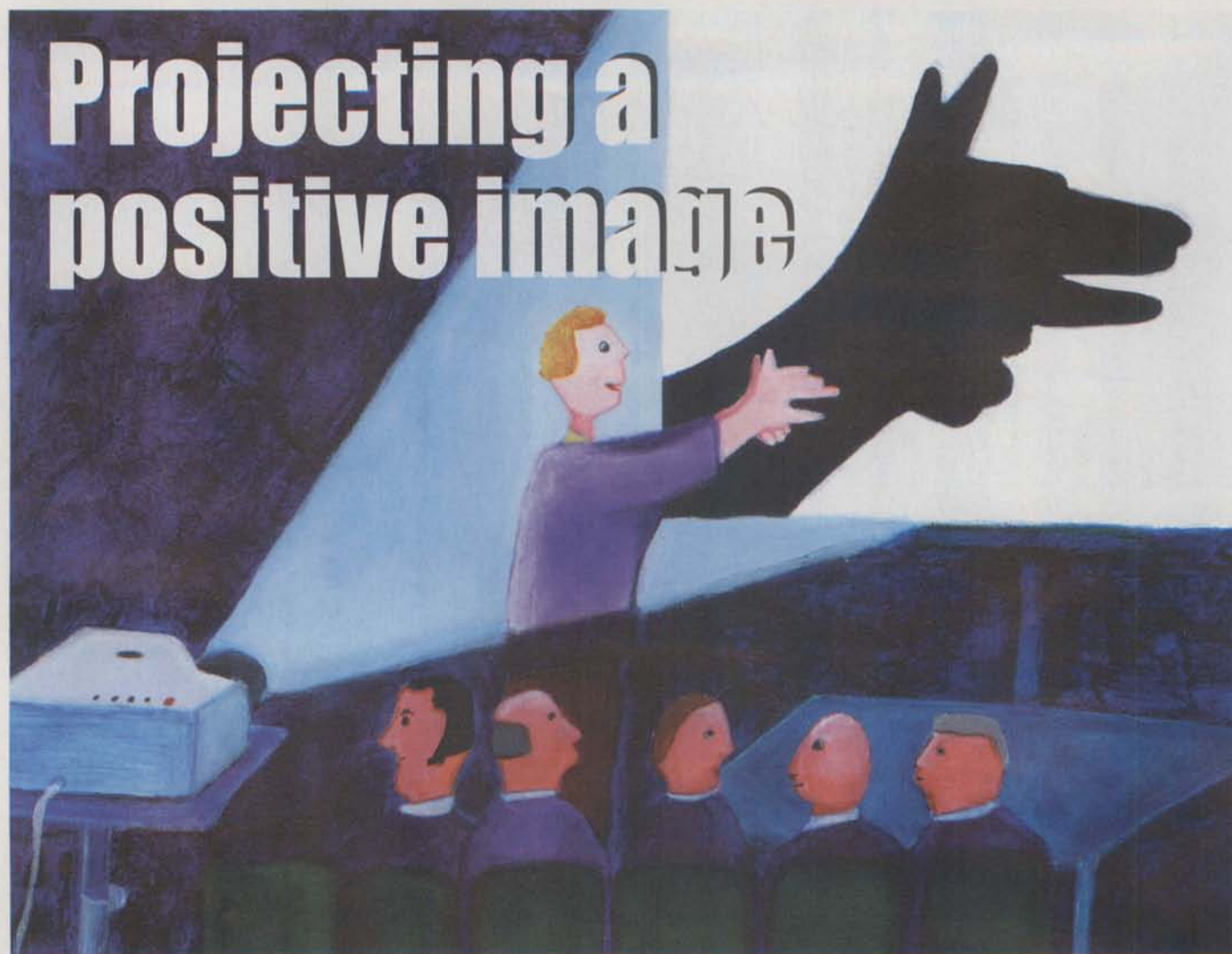
For examples of pictures taken by each of these digital cameras, see our cover CD 2.

Digital cameras: Specifications and results

Product	Agfa ePhoto CL30	Canon Digital IXUS	Canon PowerShot S20	HP PhotoSmart C500	Kodak DC4800	Kodak DC5000
Contact	Agfa	Canon	Canon	Hewlett-Packard	Kodak	Kodak
Phone	(03) 9264 7711	(02) 9805 2000	(02) 9805 2000	1 31 347	1300 130 674	1300 130 674
Price	\$769	\$1,399	\$1,899	\$1,239	\$1,999	\$1,349
Maximum resolution	1,158 by 876	1,600 by 1,200	2,048 by 1,536	1,600 by 1,200	2,160 by 1,440	1,760 by 1,168
Storage type, standard RAM	CompactFlash 4M	CompactFlash 8M	CompactFlash 16M	CompactFlash 16M	CompactFlash 16M	CompactFlash 8M
Image sensor pixel count (millions)	1	2.1	3.3	2.1	3.3	2.1
Lens specification	Autofocus 43mm, f 2.8	Autofocus 35 to 70mm, f 2.8	Autofocus 32 to 64mm, f 2.9	Autofocus 38 to 115mm, f 2.8	Autofocus 28 to 84mm, f 2.8	Autofocus 30 to 60mm, f 3.0
Battery type	4 AA alkaline	1 Lilon custom	1 NiMH 2CR5	3 AA NiMH	1 KLIC 3000 Lilon	4 AA alkaline
Connections	Mac, PC, USB, TV	Mac, PC, USB, TV	Mac, PC, USB, TV	Mac, PC, USB, TV, IrDA	Mac, PC, USB, TV	Mac, PC, USB, TV
Weight	275g	190g	280g	380g	335g	500g
Wake-up time (seconds)	5	1.5	2	5	3	3
Refresh time at maximum resolution (seconds)	1	2	2.3	4	6.5	5
Image transfer at maximum resolution (seconds)	2	2	1.5	3.5	N/A	6

Product	Nikon Coolpix 800	Nikon Coolpix 990	Olympus C-3030 Zoom	Olympus C-860L	Ricoh RDC-5300	Ricoh RDC-7	Sony Cyber-shot DSC-S50
Contact	Nikon	Nikon	R Gunz	R Gunz	Ricoh	Ricoh	Sony
Phone	(02) 9390 0200	(02) 9390 0200	(02) 9935 6600	(02) 9935 6600	(03) 9888 7722	(03) 9888 7722	(02) 9878 9712
Price	\$1,349	\$2,099	\$2,259	\$899	\$1,649	\$1,999	\$1,469
Maximum resolution	1,600 by 1,200	2,048 by 1,536	2,048 by 1,536	1,280 by 960	1,792 by 1,200	2,048 by 1,536	1,600 by 1,200
Storage type, standard RAM	CompactFlash 8M	CompactFlash 16M	SmartMedia 16M	SmartMedia 8M	Internal 8M	Internal 8M	Memory Stick 4M
Image sensor pixel count (millions)	2.1	3.1	3.3	1.3	2.3	3.2	2
Lens specification	Autofocus 38 to 76mm, f 3.5	Autofocus 38 to 115mm, f 2.5	Autofocus 32 to 96mm, f 2.8	Autofocus 36mm, f 2.8	Autofocus 38 to 114mm, f 3.2	Autofocus 35 to 105mm, f 2.6	Autofocus 39 to 117mm, f 2.8
Battery type	4 AA alkaline	4 AA alkaline	2 CR-V3 Lithium	4 AA alkaline	4 AA alkaline	1 KLIC 3000 Lilon	1 Lilon custom
Connections	Mac, PC, TV	Mac, PC, USB, TV	Mac, PC, USB, TV	Mac, PC, TV	Mac, PC, USB, TV	Mac, PC, USB, TV	PC, USB, TV
Weight	270g	375g	310g	245g	360g	280g	370g
Wake-up time (seconds)	3.5	3	2.5	2	4.5	5	3.5
Refresh time at maximum resolution (seconds)	5	5.5	2.5c	3.5	1	2.5	1.7
Image transfer at maximum resolution (seconds)	1.22	N/A	7	21	5	6	2

Projecting a positive image



So, you want to get your show on the road, but you're strapped for cash? Is no TV big enough for your lounge room? Projectors can set you back a pretty penny, but it's possible to get show-stopping presentations and movie screenings on a budget.

Fiona Williams gets thrifty and sees how far \$7,000 can get her.

With a wide variety of projectors on the market, deciding on the best and most cost-effective projector for your needs can be extremely daunting. In this review we catered for the budget-conscious, imposing a price cap of \$7,000 on the projectors featured. Distributors were invited to submit the best product available for this price.

This price limit naturally rules out many manufacturers that cater for large-scale seminar professionals or the home theatre aficionado. Their wares can sell for tens of thousands of dollars. Not all manufacturers took our price cap well: one distributor flatly refused to submit any projectors costing less than \$10,000, insisting that our readers are concerned fore-

most with quality and with keeping abreast of the latest advances in technology, where price is relatively unimportant. He felt that placing a price cap on the review, and looking at anything less than the best, would be a waste of time and effort, and a great disservice to our readers.

However, judging by reader correspondence, price and value for money are always decisive factors in purchasing decisions. Of course it's great to know what the latest advances in technology are when you're adding items to your wish list, but it's not always viable to fork out for the best. Few people can afford the projector of their dreams.

This is also true for businesses that frequently hold small group presentations or

seminars, but don't consider them the focal point of the business. There is little sense in investing tens of thousands of dollars in state-of-the-art presentation equipment when spending less will still get you an adequate result. For the intrepid road warrior, armed with a notebook and a snappy presentation spiel, some of the less expensive projectors featured here would be very attractive, as they are cased in magnesium alloy and designed to be portable.

If you often give major presentations or seminars, the modest systems reviewed here are probably not going to cut it. Low-price projectors always have some limitations. Nonetheless, they are certainly worth a look, if only to satisfy the bargain-hunter within.

Acer PalmPro 7763P

The size and design of the Acer PalmPro 7763P makes it very portable. It's slim, light (2.2kg) and small (24.3cm by 6.2cm by 19.8cm), and all components fit easily into the carry bag.

It has obviously been designed with notebook users in mind, as it lacks input options. There is only one VGA input, which rules out using a monitor while the 7763P is connected to a PC for data projection. This doesn't mean that the Acer is useless if it's not connected to a notebook, but it doesn't allow for referring to a monitor display when optimising the projected image. S-Video inputs, composite inputs (for VCRs or DVD players) and stereo audio connectors are available as optional extras on the audio/video adaptor.

Unlike the other small projectors reviewed, the Acer PalmPro 7763P is a digital light processing (DLP) unit, not a liquid crystal display (LCD) one (for a thorough explanation of the technology see 'The high end: Putting the technology through its paces' on page 113). Considering this pedigree, you'd expect the colour scale to be excellent compared to its LCD counterparts. Surprisingly, it put in the poorest showing of all. In the DisplayMate

tests, it produced dull and muted results for even the brightest colours. Intensity of blacks and greys proved to be another weakness, with only lacklustre recognition of subtle changes in the greyscale, and the true black was not of the same calibre as that produced by the NEC VT440.

The 700 ANSI lumen brightness of the Acer PalmPro 7763P was also disappointing compared with the NEC VT440 (1,100 ANSI lumens). Any images it projects are best viewed in a darkened room.

The menu is not exactly exhaustive, but is far better than that offered by the Sony VPL-CS1. There is excellent scope for brightness and contrast, but even the highest settings cannot attain clear, bright and precise character definition and colour contrast.

The Acer PalmPro 7763P is best suited to those whose primary consideration in choosing a portable projector is the price. When compared directly with competitors



such as the NEC VT440, you realise what you are missing.

Contact Acer

Phone 1300 366 567

Online www.acer.com.au

Price \$6,999

In short Good for portable projecting, but you can do better at this price.

Hitachi CPS840W

The Hitachi CPS840W borders on bulky (at 4.45kg) and has a colour scheme that is definitely drab. But don't let that put you off — it performs well where it counts.

The Hitachi was initially excluded from review as it exceeded our price cap of \$7,000. The manufacturer has set the recommended retail price at \$8,020, but we found it at Harris Technology for \$6,094. If you look around a bit more, you might find an even better price. Hitachi is aware of the price difference and stated that if

retailers can afford to charge less, they are free to do so.

The price might lead you to expect that the Hitachi CPS840W would take out honours in the DisplayMate testing. However, it was no match for the NEC VT440, which beat the Hitachi in most categories except colour (where there was little difference between the two).

The intensity and sharpness of the colour scale projected by the Hitachi CPS840W was excellent, and in both cat-

egories it equalled the NEC VT440 with a perfect score. But this sharpness did not translate well to the greyscale. The menu options do not offer comprehensive brightness/contrast adjustment, resulting in a black that was less 'true' than that produced by the NEC VT440. Greys were also slightly muddy, which was due largely to the limitations of the contrast scale.

The Hitachi CPS840W has inputs for RGB, Video and S-Video, and stereo speakers for audio functions. The remote control is comfortable and allows full access to the functions of the projector. As with the Acer, a class 2 laser diode for precise pointing sits at the tip of the remote.

This is a good choice for budget projecting, but the NEC VT440 outclassed it in APC's tests.



Contact Hitachi

Phone (02) 9888 4100

Online www.hitachi.com.au

Price \$8,020

In short Good budget projector, but lacks definition on blacks and greys.

NEC VT440

The NEC VT440 is excellent value at \$6,864, considering the features it offers. It's ultra-portable, weighing in at 3.9kg — so it won't prove a costly burden when you hit the road for presentations. It has a stylish metallic appearance but, like the Sony, is designed with the power leads at the front. This frees up a little extra length on the lead but does nothing for the appearance of the projector. Aside from the aesthetics, the unit offers some very



practical features that make for high quality displays.

The menu feature of the NEC VT440 is the most extensive of all those reviewed by APC, and brightness, contrast and colour temperature controls allow far greater manipulation of the projected image than the other machines do. Another nifty feature is the size of the remote control. The Sony, Hitachi and Acer projectors all have remotes that are ergonomically designed to fit the hand. These look quite similar to your average TV/video remote. The NEC VT440 remote, however, is no larger than a PC card; it's full of features, yet small and thin enough to fit into a slot at the rear of the projector.

The digital keystone correction is another welcome feature (surprisingly absent on all other projectors reviewed here, besides the Acer PalmPro 7763P). It corrects wedge-shaped image distortion when the projector is angled upwards at the display surface.

The NEC VT440 was the only projector reviewed with an economy option. You can toggle between maximum lamp brightness and Eco-

Mode, a setting which projects a dimmed image to extend lamp life (for up to 3,000 hours, according to NEC). This is handy, as you may not always need the unit's 1,100 ANSI lumen brightness.

Aside from RGB, the NEC VT440 offers inputs for both video and S-Video.

In testing the projectors, the NEC VT440 was the clear leader and set the benchmark by which all others were judged in DisplayMate. The sharpness of images was extremely impressive, making text easy to read. The clarity came as a welcome relief to the APC Labs tester's weary eyes. In fact, the quality of the images produced was so good that no other projector came close to matching it. The Sony offered the second-sharpest images, but there was a significant difference between the two.

Contact NEC

Phone 13 16 32

Online www.nec.com.au

Price \$6,864

In short An excellent projector for quality presentations on a budget.

Sony VPLCS1

Weighing in at 2.9kg, the Sony VPLCS1 belongs in the company of the Acer PalmPro 7763P, its main rival in the portability stakes. Unlike the Acer, this projector has an excellent range of inputs to choose from. The Sony VPLCS1 accepts PC signals up to SXGA (with a native resolution of SVGA 800 by 600) and has inputs for composite video, S-Video and RGB. USB cables and software are bundled with the projector.

As you would expect from Sony, the design of the unit is interesting. The lens is covered by a flip-top hood, which serves a dual purpose. Not only is it an extremely large lens cover that prevents dust from getting at the lens, the open hood also works as a stand for boosting the projector. The obvious drawback of this feature is that height is always fixed, so you might want to keep alternative methods of height adjustment (stray telephone books, back issues of APC) on hand for emergencies. The remote control is



ergonomically sculpted to fit the hand and features a directional disc. Both these features have also been adopted on the Hitachi remote.

The Sony VPLCS1 makes good use of its 600 ANSI lumen output, with far better brightness than the 700 lumen Acer PalmPro 7763P.

The colour quality was rather underwhelming, not quite attaining the clarity and sharpness of the NEC VT440 or Hitachi CPS84W. The limited menu does not allow for variations in colour intensity or temperature, which certainly contributed to the problem.

At \$5,555, the Sony VPLCS1 is not the ultimate in projector technology, but it ably manages basic functions. It would be suitable for desktop presentations and tutorials in conventional business settings or on the road. Those looking for a low-cost lounge room projector would also be well served by this machine.

Contact Sony

Phone 1800 017 669

Online www.sony.com.au

Price \$5,555

In short This is a basic projector with limited menu functions, but it has many input options and is very portable.

The high end: Putting the technology through its paces

Projectors are great for business presentations, but a far better use is projecting your favourite movies and TV programs on to a wall in your home. Both the Sony VPL-VW10HT and the Davis DLS-8 aim to produce high-quality images from film and TV (including upcoming HDTV), as well as being standard output devices for PCs.

The technology

The Sony and the Davis utilise two different technologies. The VPL-VW10HT uses three 16:9 LCD panels to reproduce movies on your wall or screen. The three 1,366 by 768 LCD panels each produce a core colour of red, green and blue to provide an accurate colour resolution of 1,049,088 pixels. Because it's a digital system, the resolution is sharp and clear, ideal for reproducing film and TV, but it has its limits. Light beaming through LCDs makes it hard to produce accurate blacks, which affects image quality. Better contrast can be achieved with digital light processing (DLP) technology.

The Davis DLS-8 uses DLP, an invention of Texas Instruments. Rather than light passing through LCD panels, light reflects on to thousands of minute mirrors, each representing a pixel, controlled by a DMD (digital micromirror device). The mirrors are tilted in or out by 10° up to 1,000 times a second. For a single DLP system such as the DLS-8, a colour 'wheel' filters the reflected light through the core red, green and blue colours. Using up to three DMDs allows for a dedicated DMD per colour.

The testing

After eight DVDs and hours of Foxtel, both projectors got the thumbs up, for different reasons. The Sony has plenty of features for a home theatre system, including component inputs, which produce outstanding image quality from a DVD player with component out. With its full control over aspect ratio, you can fit a 4:3 or 16:9 image correctly, and zoom the image until it fills the full resolution of the projector.

Sony VPL-VW10HT

Contact Sony

Phone 1800 017 669

Online www.sony.com.au

Price \$11,990

Davis DLS-8

Contact Campsie Hi-Fi

Phone (02) 9750 4000

Online www.campsiehi-fi.com.au

Price \$10,999

The Davis DLS-8 handles film content as easily as it does a Windows desktop, but provides much less control over how the image is displayed. The difference the DLP makes is considerable: a much better contrast ratio leads to brighter, more vibrant colours. DVDs look stunning using DLP, but because the DMD used in the DLS-8 only supports a resolution of 800 by 600, 'jaggies' are clearly visible.

Ashton Mills

How we tested

The performance of a projector is a subjective judgement because the only way you can measure the brightness, contrast, colour and picture quality of a projection is by using the human eye.

To achieve the most accurate results possible, APC Labs used Sonera Technologies' program, DisplayMate for Windows Video Edition Version 1.21. To limit discrepancies, all of the projectors were tested by the same person.

We set up a NEC VT440 as the 'baseline' projector against which all others were compared. This projector was calibrated to give the best picture possible, and then rated with a score of 8 for every result. (Note: the baseline projector had to be of a high quality.)

The projectors were connected to a Dell Pentium II 300 with 32M RAM and an ATI 3D Rage Pro graphics card. The video signal was split on a cable capable of 1,024 by 768 at 85Hz on each connection, although the testing software used a resolution of 800 by 600 at 85Hz, this being the optimal resolution for each projector. All projectors were calibrated to give the best results possible.

We looked for the following factors.

- Colour misregistration — slight distortion of contrasting colours where they meet (horizontal and vertical).
- Background interference — anything that affects the image and is not normally projected.
- Colour purity — uniformity of colours across the screen.
- Focus — general image quality over the display (particularly the corners).
- Ghosting and streaking — images present that shouldn't be (usually noticed with high contrasting images).

We scored the monitors from 0 to 10, with the baseline monitors scoring 8 on every count for comparison. Points of comparison were the following.

- Image sharpness — did images of varying sizes have loss of definition or 'fuzziness'?
- Text readability — how well could the text could be read in different sizes and colours or on different backgrounds?
- Colour sharpness — how well defined were the colours?
- Colour quality — how true were the colours? Was there any loss of quality across the screen? Any misregistration?
- Brightness — how bright was the display? Was white as bright as it could be?

EDITOR'S CHOICE

Australian
Personal
Computer

NEC VT440



Highly commended:
Sony VPLCS1

The clear pick of the bunch was the NEC VT440, which has a clarity and colour intensity that is hard to go past for less than \$7,000. An honourable mention goes to the Sony VPLCS1 which offers an excellent range of input capabilities and is light and portable.







Choose your **own** adventure

*While there are only a few versions of Windows, Linux versions seem to proliferate like rabbits. How do you choose which Linux distribution is the best for your needs? APC's **Mike MacCana** is here to help.*

No operating system satisfies the needs of all users. Developers of Linux distributions recognise this fact, and have put together an astounding array of different packages.

So what is a distribution? The Linux kernel, as Free Software Foundation founder Richard Stallman is keen to point out, is only one small but important piece of software. Without software and services surrounding the kernel, it's not much good to anyone. A distribution packages applications with the kernel, along with a set of routines for partitioning the hard drive, selecting packages and setting up the system. Different distributions vary in their basic Linux kernel version, software, user interfaces, installation programs and documentation, as well as in support services and professional certification.

Each distribution can run the same software, but has a different audience and different purposes. For example, Caldera's products are aimed at conservative corporations, Debian's at the technically knowledgeable, and Mandrake's at desktop users and gamers. Some packages rely totally on free software developed by the open source community, others try to differentiate themselves with proprietary commercial software.

Linux distributions have come a long way since the last time APC reviewed them

(see APC September 1998, page 90). Back then, graphical installers were rare, distributions were very raw (getting a graphical user interface up was a major undertaking) and they were not easy to use. Now we have graphical installers, some very polished distributions and systems that should never require you to drop to a command prompt. There is still a way to go before Linux achieves the UI polish of Windows or Macintosh, but it's catching up quickly. However, APC still wouldn't recommend it for beginners.

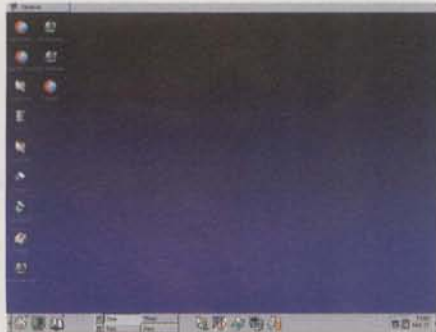
Here we review eight of the latest Linux distributions and rate them according to how well they satisfy the two main purposes for which they were intended: the consumer or corporate desktop and the corporate server. We're aiming for a low-cost, stable operating system capable of performing basic desktop and server tasks. Desktops should require little or no Linux knowledge, whereas servers must provide support and training options.

Each distribution is rated out of ten for both desktop and server applications. This rating applies to the supplied applications and the packaging of those applications. The best distributions put the best set of applications together and package them in ways that make the applications easily accessible.

Caldera OpenLinux eDesktop 2.4, eBuilder and eServer 2.3

Caldera's Linux products have always been aimed at the corporate market. They have friendly integrated setup routines and require minimal retraining for staff familiar with basic networking concepts.

The eDesktop version of OpenLinux comes with a modified version of PowerQuest's PartitionMagic/BootMagic combination, for simpler dual-boot configuration. Also included are the 128-bit encrypted Netscape Communicator, Adobe Acrobat Reader, Citrix's ICA client, Macromedia Flash and StarOffice, as well as an outdated version of RealPlayer and a cut-down version of Caldera's own Cameleo Light graphics application. Oddly enough, the eDesktop version also has Apache, as well as other



server-based tools. The OS performs well, but lacks the vast range of applications found in other distributions (some buyers might see this as a plus). It was particularly disappointing to see its PPP dialler lagging behind that of Red Hat.

eServer-specific applications include Apache with PHP3 support, MySQL and a careful selection of other quality open- and closed-source server applications. The eBuilder product combines eServer with IBM's Websphere Application Server, VisualAge for Java, and Caldera's eBuilder application for ecommerce development (merchandise handling, order management, shopping, payment, shipping, tax, membership/profile and order processing). Documentation is quite comprehensive, with well-written and thorough manuals for all three distributions.

OpenLinux was the first distribution to feature a graphical installation routine. APC found the install process quite elegant. Time was saved during the installation by continuing configuration questions during the actual file transfer process. Once installed, configuration occurs in two main places — the KDE Control Center and Webmin. Basic networking tasks are established via an extended KDE control centre.

Ongoing maintenance is handled remotely using Webmin, a Web-based configuration utility. It is unattractive, but it works very well and is capable of handling manual tweaks to configuration files.

Summary

eServer is a full-featured Linux/Unix server system that provides high performance for a minimal price, but it requires Linux or Unix knowledge to operate. eDesktop works well, but lacks the range of applications usually available.

Kernel version 2.2.14

Desktop KDE 1.2, Gnome (optional)

Contact Caldera Systems

Phone (02) 9686 4055

Online www.caldera.com

Price Free software versions of all three are available. For supported versions: eDesktop 2.4 \$80; eServer 2.3 \$210. eBuilder is not currently available in Australia.

Rating

Desktop features eDesktop ██████████

Server features eServer ██████████

eBuilder ██████████

Corel Linux OS 1.1

Corel's Linux distribution is mainly a vehicle for its other Linux-based software, notably WordPerfect Office 2000 for Linux. Aimed at the desktop market, Corel Linux OS 1.1 is based on a modified Debian distribution, combining Corel's own user interface style with Debian's sound technical qualities.

The graphical installation works reasonably well. It's quite simple and asks a minimum of questions while automati-

cally detecting basic hardware. However, it did ignore our test system's soundcard, Zip drives and 3D card settings.

The desktop is built around a heavily modified version of KDE, which is the only interface available. The system is tuned for Windows compatibility; the login screen allows you to log on to an NT domain or Windows workgroup, and Corel's file manager allows you to share folders and browse the network in much the same way as Windows Explorer and Network Neighborhood.

Like Caldera, Corel Linux uses the KDE Control Center for most of its configuration, keeping user interface and system setup concerns in the same dialog. KDE menus are arranged quite well, but Corel Linux has few bundled applications. Even basic shareware applications like Acrobat Reader are only included in the commercial versions of the distribution. The free download does not include an office suite, but Corel hopes that people will

buy the commercial versions of the product which include WordPerfect Office 2000.

The package is installed using a customised setup program that acts as an interface for the Debian packaging system. Corel Linux ships with Debian (DEB) packages and Corel prefers them over the more common but less powerful Red Hat Package Manager (RPM) files, although the 1.1 version can install RPMs.

Summary

Corel provides a good way for Windows users to move to Linux, but has a very narrow range of features.

Kernel version 2.2.14

Desktop KDE 1.2

Contact Corel

Phone 1800 658 850

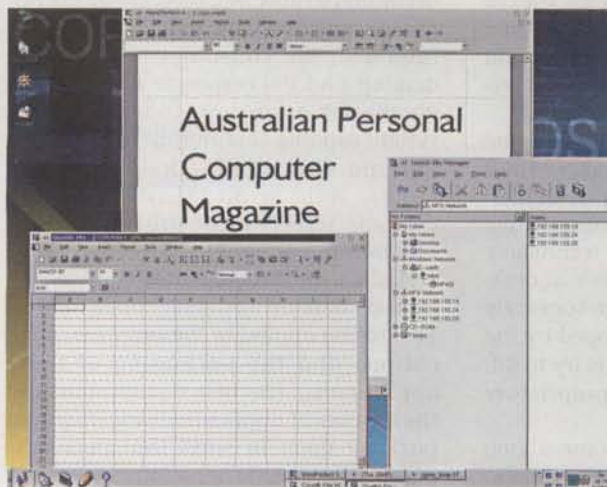
Online www.corel.com

Price Free software components are available for download. Boxed set: \$87.65.

Rating

Desktop features ██████████

Server features ██████████



Debian GNU/Linux 2.1

Described as 'Linux for hackers, by hackers', Debian is respected among technical Linux users as a compact and well-crafted distribution. It isn't user friendly and it doesn't try to be; it's a hands-on way to run a finely tuned server operating system, and demands extensive Linux knowledge. Debian 2.1 uses the older Linux 2.0 kernel by default, but 2.2 can be installed.

Installation is text-based with little help provided, and Debian does *not* boot graphically by default. Most Debian users appreciate the system's slim require-

ments. Debian will run on a wide range of hardware, easily converting your old 486 into a capable Linux-based firewall or mail server.

The desktop is almost non-existent. Configuration is performed by directly editing the configuration file for a given application. Debian uses its own packaging system known as DEB, through which a single command can upgrade the entire operating system without any further interaction. It connects to the fastest server, downloads the necessary packages, resolves any dependencies automatically, and installs the software.

As Debian is targeted at the expert Linux user, most of its installations end up with a highly customised selection of software installed. Although the current stable release is based on the aging 2.0 kernel, many users have installed packages to upgrade to a 2.2 or 2.4 beta kernel. Likewise, KDE is not included in Debian, but many distributors package either the latest stable version of KDE or the KDE 2.0 beta. Debian is so customisable you can choose to get

rid of Linux. There's even a Debian distribution variant that provides the same set of software built around another operating system kernel known as GNU/Hurd.

Debian is built entirely around open source software. Its creators use the official Open Source Definition as a guide to what can and can't be included in Debian. Closed source software can run on it, but is never included in the main distribution.



Summary

Debian is a brilliant Linux distribution for the technically capable, but as we're aiming for a system which requires little knowledge of Linux, Debian gets low scores.

Kernel version 2.0.36

Desktop Gnome optional.

Contact Debian

Phone N/A

Online www.debian.org

Price Free download

Rating

Desktop features ■■■■■■■■■■

Server features ■■■■■■■■■■

e-smith server and gateway 3.1

One of a new breed of 'thin-server' Linux distributions, e-smith is designed to perform a set of server-specific tasks without any required Linux or Unix knowledge, downtime or cost. A modified version of Red Hat Linux 6.0, e-smith has a simple installer that confirms your permission to install and installs itself without any further questions. All hardware is autodetected. e-smith doesn't use X (Linux's graphics mode). It uses an equally simple menu-based character mode installer.

Once installation is finished, the machine reboots to its basic configuration screen — another menu-based, character mode application. This application configures IP settings, Web site names, DNS servers and other basic networking details. Proxy, Web cache, email, DHCP, DNS, LDAP, SMB (Windows file and print sharing) and Appletalk (Macintosh file and print sharing) services are included. The distribution and its documentation are entirely



open source, and no Linux knowledge is required at any step of the way.

No bugs or anomalies were encountered. It took exactly seven minutes to install a working e-smith Web, intranet, LDAP, file and print, and email server. As e-smith supports Windows file and print sharing, we were able to upload content to our Intranet and Internet servers by drag-

and-drop in their Windows Network Neighborhood. The LDAP service allowed us to establish directory services for an entire department in seconds, and is the easiest directory service to set up on any operating system.

A console is available, but it's not necessary for running any part of e-smith. Experienced Linux administrators can use it to access diagnostic tools and external software packages for Red Hat 6.0.

There are three small drawbacks. Major server reconfigurations require rebooting the server, which is typical for

many operating systems, but unnecessary for Linux. Lack of services such as VPN and firewalling (beyond basic proxying) is also a concern. A Linux consultant could be hired to install and configure these services, or a separate firewall could be used.

Just as APC went to press, a new version of the OS was released. Version 4.0 has updated packages and, according to e-smith, is easier to use.

Summary

The best Linux server distribution.

Kernel version 2.2.5

Desktop Only interface is menu system and Web-based GUI

Contact e-smith

Phone N/A

Online www.e-smith.com

Price Free download. Boxed set for e-smith 4.0: \$US595 (order online only)

Rating

Desktop features N/A

Server features ■■■■■■■■■■

Linux-Mandrake 7.1

Linux-Mandrake started life as a special KDE-based version of Red Hat, back when Red Hat didn't carry both desktop environments.

There are four CDs in the boxed distribution: install, application, extensions and sources, as well as a small install manual. The applications CD includes StarOffice, Acrobat Reader, Flash and other popular non-open source software,

Summary

Great for desktops. For server use, look elsewhere.

Kernel version 2.2.15

Desktop KDE 1.2 default, Gnome 1.2 included.

Contact EverythingLinux

Phone (02) 9712 1799

Online www.linux-mandrake.com/en
www.everythinglinux.com.au

Price Free download. Boxed set with support: \$86.90.

Rating

Desktop features ■■■■■■■■

Server features ■■■■■■■■

while the extensions CD includes a stack of useful free software. Mandrake knows what desktop users want and gives it to them, with quality graphical applications for performing almost any task.

Mandrake has its own attractive, high-resolution installation routine that performed flawlessly on our test machines. The partitioning application from Mandrake's installation program is capable of resizing Windows partitions while keeping their data safe for dual-boot installations. Hardware support is excellent, utilising our ATA66 hard disk and Zip drive correctly straight away. Mandrake also comes with special kernel modules to support Intel's integrated video chips, 3D on nVidia's GeForce and XFree86 4.0.



SERVER LINUX DISTRIBUTION

e-smith server and gateway 3.1

A brilliant Linux distribution. It's small, stable and easier to install and configure than any other version of Linux, or any version of Unix, Windows, Netware or Mac OS.

DESKTOP LINUX DISTRIBUTION

Linux Mandrake 7.1

By far the best Linux to arrive on the desktop yet. Despite its buggy reputation, Mandrake is more stable than most non-Linux operating systems.

Once the install is finished (about 25 minutes for two of the CDs), Mandrake gives you the choice of KDE or Gnome 1.2 (the latest, much-improved version of Gnome). For most network services, Mandrake uses an old version of Linuxconf.

Our test install went well, but there have been reports of bugs in 7.1.

Red Hat Linux 6.2

Red Hat Linux is the top-selling Linux product in the US and Asia. It was the first commercial Linux distribution and was the first to feature software packaging. The distribution is entirely open source and has become the basis of other distributions such as Mandrake and e-smith.

Installation is friendly and graphical, although it ignores setting up sound-cards, Zip drives and access to non-Linux partitions. Red Hat 6.2 also includes a partitionless install feature which installs Linux as a large file on a Windows hard drive. This requires the machine to be booted using a floppy disk.

Once installed, Red Hat uses the



Gnome environment as its base, which is fairly well configured with a small degree of customisation. Red Hat's configuration tools are mainly located in the menus. Red Hat's desktop includes a small but useful selection of software. Red Hat also comes with KDE, but its KDE environment has a horrible menu arrangement and a number of small features don't work.

Red Hat's main configuration tool, Linuxconf, comes in both a console and GUI version. The console version works quite well, but graphical Linuxconf has occasional difficulties reading hand-edited configuration files. It also has several annoying user interface problems. Due to the inconsistencies of Linuxconf, most server configuration is still done by hand.

Red Hat Linux is entirely open source, and Red Hat makes most of its revenue from corporate services such as training and certification. Red Hat, like SuSE and TurboLinux, aims to expose potential system administrators to, and educate them about, Linux internals. Unlike the aforementioned companies, Red Hat has the local presence to back it up, with a stack of corporate training available in Australia for server administrators.

As a result of its market share, Red Hat enjoys the most support from both open source and commercial developers. More packages are available for Red Hat than any other distribution of Linux, and most commercial Linux ports are tested and debuted on Red Hat.

Summary

Red Hat's support services, partnerships and specialised distributions make it appealing to those wanting full exposure to Linux. For desktops, look elsewhere.

Kernel version 2.2.15

Desktop Gnome 1.1 default, KDE 1.2 included.

Contact Red Hat

Phone (07) 3257 4811

Online www.redhat.com.au

Price Free download. Box set: Standard \$76.70; Deluxe \$164.48; Professional \$327.80

Rating

Desktop features ■■■■■■■■

Server features ■■■■■■■■

SuSE Linux 6.4

SuSE is the top-selling Linux in Europe, and it is easy to see why. SuSE is an excellent server distribution with a number of cutting-edge technical improvements.

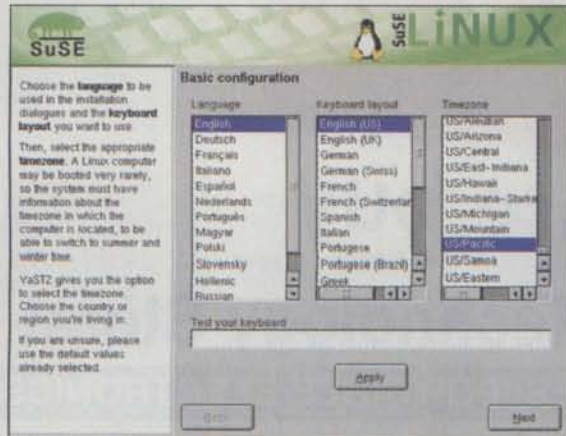
However, it's not a distribution for the faint-hearted. It comes on six CDs or one

a distribution that has only the best packages, and not every package, try Caldera or Corel instead. However, if you're familiar with many applications and have know which ones you want on your system, then this just might be the distribution for you.

Installation is the standard graphical fare, and is performed competently. Soundcards and modems were not installed during the startup process, but SuSE does support USB keyboards, mice and scanners.

SuSE's desktop is a little disappointing. It has inefficient Gnome and KDE menus, and a surprisingly narrow variety of useful installed software which includes the usual StarOffice and an older RealPlayer, but little else of note.

SuSE's server features include ReiserFS, a high-performance database-style file system with full transaction support. Support for memory up to 3.5G is an added advantage, and raw device support allows the use of native storage for Oracle and databases. LDAP support is also included.



DVD, and takes quite a while to install. It seems that SuSE has included every Linux application under the sun in this package. Some users might like the vast number of options SuSE provides, but others will be daunted by the sheer volume of the package. If you're looking for

Once the install is finished, configuration is via YAST2 (Yet Another Setup Tool version 2.0), a graphical application that covers all basic networking functions. It's less comprehensive than Red Hat's Linux-conf, but suffers none of the bugs. Other server configuration is performed by hand.

Summary

As a desktop, this lacks the simplicity of other distributions. It's good as a server, as long as you know Linux or are willing to learn from the documentation.

Kernel version 2.2.14

Desktop KDE 1.2 default, Gnome 1.2 included

Contact EverythingLinux

Phone (02) 9712 1799

Online www.suse.com

www.everythinglinux.com.au

Price Free download. CD or DVD version for Intel: \$98.95.

Rating

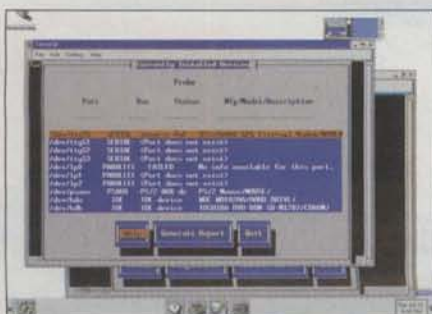
Desktop features ■■■■■■■■■■

Server features ■■■■■■■■■■

TurboLinux Workstation 6.0, Server 6.0, and TurboCluster Server 4.0

There are three different versions of TurboLinux: Workstation, Server and TurboCluster Server. TurboCluster is the business 'killer app' that allows you to easily cluster Linux, Solaris and NT Servers at a much lower price than similar software.

The installer for all these products is at least four years behind all other Linux distributions. Almost no hardware is automatically detected. Bare bones installers are fine (and frequently desired) qualities for distributions aimed at technical enthusiasts, but as TurboLinux's products are aimed at the corporate market, it does not compare favourably to similarly targeted distributions such as Caldera, Red Hat or e-smith.



Workstation includes an old version of Gnome and KDE 1.2, with packages for StarOffice, Citrix ICA Client for Linux, MySQL and a number of other useful applications on the second CD. These are not added to the menus when installed.

It's easier to recommend the Server version of TurboLinux. Despite the same agonising install process, TurboLinux Server incorporates some innovative concepts with a number of sensible pre-made configurations. The Server version also comes with a stack of useful applications preconfigured — BRU Professional (a popular Linux-based tape backup system), EnlightenDSM (a comprehensive network monitoring and configuration system), OpenMerchant (an open source ecommerce suite and shopping cart application), Tallyman (an ecommerce store management application), Twig (a Web-based email system) and Icecast (an MP3 media streaming host).

Basic configuration uses a series of effective character mode applications for networking, printing, X Window and package updates. These are simple programs that work quite well, and are fully documented in the well-written user guide.

The feather in TurboLinux's cap is the

TurboCluster Server, a powerful clustering application designed to take any application (on any OS) and create massive-scale, fault-tolerant systems. TurboCluster Server is an excellent (although proprietary) solution for high-availability systems.

Summary

Installation and the workstation version need lots of work. TurboLinux Server lacks support. TurboCluster provides excellent value for clustering.

Kernel version 2.2.14

Desktop Gnome, KDE also included

Contact TurboLinux

Phone (02) 9252 6011

Online www.turbolinux.com.au

Price Workstation 6.0 \$55; Server 6.0 \$406.9;

TurboCluster Server 4.0 (2-node) \$2,194.50

Rating

Desktop features ■■■■■■■■■■

Server features

TurboLinux Server ■■■■■■■■■■

TurboCluster Server ■■■■■■■■■■

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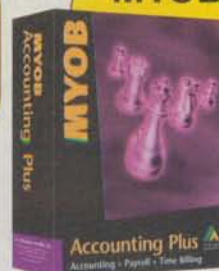
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ozbuy.com price

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OZB1003

The great OS platform grab

The July issue of *APC* would have been a special issue for most Workshop readers, with its cover CD containing full versions of Red Hat Linux 6.2, BeOS *Personal Edition* and OS/2 Warp 4. It is nothing new to find that *APC*'s readers appreciate the importance of alternative operating systems, but Microsoft's impending division, and the new antipiracy measures that it will apply to its OEM software, could well drive demand for these alternative operating systems to new heights.

This could be the opportunity that software developers and users have been looking for. Tell us which operating systems and platforms you would like to know more about. If we don't cover them, let us know which ones you'd like us to add.

Andrew Colley, *Workshop coordinator*

Workshop invites your contributions. Please send your ideas, comments or criticisms to workshop@acptech.net, or to our snail mail address at APC Workshop, PO Box 4088, Sydney NSW 1028. Alternatively, you can join one of the online discussion forums at apcmag.com to raise technical issues with fellow DIY enthusiasts or voice your opinion on any topic featured in Workshop.



Bug of the month

Something strange happened this month. In amongst the dozens of screenshots of Windows error messages, we received two Linux bug reports. The winner, Stuart Low, tried to *expire* his news server (delete messages which are past their use-by date) and his news server software displayed some very interesting arithmetic.

```
[root@SERVER ppp]# fetchnews
[root@SERVER ppp]# texpire
alt.www.webmaster: 0 articles deleted,
3600 kept
aus.ads.forsale.computers: 0 articles
deleted, 242 kept
aus.ads.forsale.computers.new: 0 articles
deleted, 376 kept
aus.ads.forsale.computers.used: 0 articles
deleted, 1319 kept
total: 67 articles deleted, 5291 kept.
[root@SERVER ppp]#
```

Let's see, $0+0+0+0=67?$
For that matter,
 $3600+242+376+1319=5219?$ (Trust us, it doesn't!)

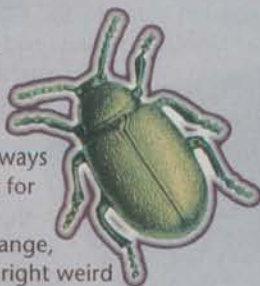
Win! Win! Win!

Workshop is always on the lookout for the most interesting, strange, funny or downright weird software bugs you can find. These include code snippets, features that function poorly, or things that crash a particular application. Anything and everything buggy deserves mention.

Send us your favourite bug via email to bugs@acptech.net or snail mail to APC Bug of the month, PO Box 4088, Sydney NSW 1028, and you'll be in the running to win a one-year subscription to *APC*. Please send screen captures, example code listings or detailed instructions to trigger a bug in an application, as appropriate for your entry.

The winner's name, along with details of the bug, will appear in this column in *APC* September. So start hunting!

Michael Smith



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Continuing our series on storage, we look at compact disc technology: from hi-fi to high capacity.

Inside your CD drive

CD-ROM drives are an integral part of most modern computer systems. There may be differences in graphics capabilities, sound, and even raw processing power, but just about every system has a CD-ROM drive installed. This is because both the drives and the media are cheap to manufacture and are packed with capacity, compared to the storage methods that preceded them.

Audio isn't memory — or is it?

The CD didn't start out as a computer storage medium. It was originally produced in 1980 as a high-fidelity audio medium, although the basic ideas behind the CD had been developing since the 1960s. The original intention, so the story goes, was to produce a single disc with the capacity to hold Beethoven's Ninth Symphony.

The principles of audio and data CD-ROMs are still essentially the same. Unlike floppy disks (see *APC* August, page 118) or hard drives, CD-ROMs use optical technology to store data on a compact disc. A laser diode within the CD-ROM drive shines a light out to the head, which is basically just a reflecting mirror array. The head moves across the compact disc, shining the reflected light onto its surface.

The disc has a tightly wound spiral imprinted onto it, referred to as a track. Covering the entire track is an aluminium coating that reflects light. The light emitted from the head shines back at a particular intensity, based on whether or not it hits an indent (usually referred to as a 'pit') on the CD surface. The presence or absence of a pit determines how much light bounces back, and can be expressed as zeroes and ones. The data can be audio, video, numeric, or any combination of these (see 'Book standards', at right).

CD media

The physical construction of a CD isn't difficult to grasp. A standard disc is 12cm in

diameter, with a musical capacity of about 74 minutes. In data terms, these discs can hold about 650M of data.

The disc is made from a polycarbonate substrate with a layer of aluminium applied for reflectivity. A thin plastic coating is then applied to protect the disc. As CDs were designed mainly for home audio, it was important to make a disc that could survive the cat walking on it. Compact discs might seem flimsy, but they were designed to replace LPs, and there's little argument about which is the winner in the durability stakes. It was originally claimed that CDs would have a life span of centuries. That was certainly hyperbole, but CD is a very reliable removable data format.

CD-ROM drives and speed

One thing you often see referred to with CD-ROM drives is the *speed* of the drive. CD-ROM drive speed originally referred to the common speed that CD-Audio drives needed to read data and translate it into music. For a CD-ROM drive to deliver data at a constant rate it must read that data at a constant rate. As the CD spins in the drive, a read head moves over its surface, reading the data.

This poses a simple problem. Let's say that the disc spins once every second and the length of the track closest to the centre of the disc is 5cm. The drive head is reading data at 5cm per second. However, at the outer edges of the disc the tracks are much longer and the disc is still spinning at one revolution per second (rps). The head must now read and deliver data at a much higher rate, as it will pass over a greater circumference area in that single spin. The solution to this problem is also simple. In order to maintain a constant data delivery rate, the drive alters the rate at which the CD is spun, depending on where the read head is currently situated on the disc. This is known as Constant Linear Velocity (CLV).

CLV is fine for audio, where a constant stream at a low data rate is required, but the jump to using CDs for other data applications brought with it the desire for

Book standards

Compact disc types are produced according to standards laid down by the creators of the compact disc format, Sony and Philips. Later standards apply more to Philips than Sony, as Philips pursued several different CD standards with varying success, while Sony's interest has been mostly musical. The standards are supposedly named for the colour of the booklet they were first proposed in.

Red Book

Red Book CD is the grand-daddy of CD formats, and is used for CD-Audio players worldwide. Red Book is an international standard (ISO 10149) and contains exact specifications for data rates, encoding methodologies and so on.

Yellow Book

The Yellow Book standard dates from 1984 and describes CD-ROM as we know it. The Yellow Book specification splits data into two 'modes'. Mode One is computer data and Mode Two is what is now referred to as 'multimedia' — a combination of audio and video data. Yellow Book is also referred to as 'High Sierra', or by its number, ISO 9660.

Green Book

The Green Book standard was a Philips invention, used to define what it calls CD-I, or interactive CD. Interactive CDs are like Yellow Book CDs, except they use compression techniques to extend the amount of data that can be stored — up to two hours per disc.

White Book

The White Book standard is similar to the Green Book specification, except that it does away with the need for a CD-I player to accompany CDs. Instead, White Book CDs must include some form of player software with them. By using this standard, White Book CDs work in CD-I systems as well as regular Yellow Book CD-ROM drives.



higher data rates. The earliest CD-ROM drives increased the CLV spin rate, and used multipliers of that spin rate to determine their eventual data throughput. If you bought a 2x, 4x or 8x CD-ROM drive, you would get two, four or eight times more data through than the specification for an audio drive. The data rate of a 1x CD-ROM drive is roughly 150Kps, so an 8x CLV drive optimally puts out 1.2Mbps.

For audio CDs running at 150Kps, CLV was fine, but data transfer's need for higher speeds posed serious problems. There's only so fast you can spin a disc before it starts sounding like a jet engine. If you have to continually accelerate and decelerate the drive, the braking mechanism needs to be particularly tough. This increases the cost of the drive and shortens its life span.

Late model CD-ROM drives use a technology that's been standard in hard drives for a while: Constant Angular Velocity (CAV). CAV appeared as CLV drives were reaching 12x spin speeds and solved the acceleration/deceleration problem. CAV drives always spin at their highest possible speed.

Manufacturers can be a little dishonest when rating CAV drives. A 24x CAV drive delivers 3.6Mbps on the outer tracks, but nowhere near that capacity on the inner tracks. Some drive manufacturers are less deceptive. They list dual speed ratings for the inner and outer tracks. If you see a drive listed as 12/32x, the lower rating reflects the speed you get on the inner tracks.

CAV drives seem slow to get moving on an initial data read, but this is because of the high speeds they run at. They often run at three to four times the speed of their CLV counterparts, and it takes longer to reach those speeds.

Master versus pyromaniac

The recording industry leapt at compact discs, and not only for their capacity for high-quality sound. Until fairly recently they were basically impossible to copy. Almost all brand name CDs begin with a CD master, from which an imprint is made. This imprint is then used to press as many discs as required. Mastering is expensive and is usually only done for discs with production runs in the thousands. The machinery required to master and press CDs was (and still is) very costly and this meant that home piracy wasn't possible. CD-R changed all that. The growing availability of drives and cheap media

to use with them has meant that CD recording is now open to almost anybody.

CD-Rs work in a fundamentally different way to mastered CD-ROMs. With a mastered disc, a substrate is pressed with the pits already in place for whatever software is contained on the disc. CD-Rs (and CD-RWs, which are rewritable) use blank discs, and support other options such as the ability to write to the disc one portion at a time.

CD-Rs differ from mastered discs in two important ways. First, they have the formatting spiral pre-stamped. This means that the data capacity of a CD-R is set in stone, even if its contents aren't. The second difference, and the one that makes CD-R recordable, is a layer of photoreactive dye above the reflective layer of the CD. This dye is affected by light. A laser beam within the CD-R drive burns away specific sections of the dye to create the pits and levels on the disc. This is why CD-R recording is often referred to as *burning*. Once the dye is burnt away, the CD is the same as a mastered disc, with contents that can't be changed.

CD-Rs allow for multisession recording, which means that the CDs can be written in stages. This sounds great in theory, but there is a catch. The first section of the CD that needs to be written is the table of contents (TOC), along with a section to lead into and out of the data. The TOC tells the reader what's on the disc and where, rather like a directory readout of a folder on your hard drive. The first time you burn a multisession disc, a TOC is created for those contents only. This TOC can't be altered. When you add content, a new TOC must be created, and this uses up about 13M of space each time.

The need for the lead in and out of areas is a result of the original audio specification of CDs. A sufficient gap was allotted for error checking, as well as a period of silence before and after full albums. TOC requirements make planning CD-Rs, rather than burning them one bit at a time, worthwhile. A newer standard, ISO 13346, allows for multisessioning without this overhead, but older drives don't always read ISO 13346 discs properly, so it's still worth planning ahead.

Alex Kidman



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Orange Book

A joint Sony/Philips invention, the Orange Book standard defines recordable CD standards. As it involves more than just reading data from a disc, the specification also covers data writing rules, laser intensity and CD-R composition. The Orange Book standard deals with CD-RW as well, which uses a different chemical layer and laser composition to allow overwriting.

Blue Book

The Blue Book standard (occasionally referred to as CD-extra) covers a slightly different type of hybrid data/audio CD. A normal data CD which includes audio places the data on the first track. Blue Book CDs do the reverse, putting audio tracks first. This allows music producers, who may not fill an entire album, to put video or other 'extras' on the disc for those with appropriate CD-ROM drives.

Photo-CD

The only proprietary format to be widely accepted is Kodak's Photo-CD format, which specifies a multisession CD for image storage. Photo-CDs use a slightly different dye (which Kodak claims is more light resistant, and therefore has a longer shelf life) and a slightly thicker protective plastic coating.



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Is QoS the express post of
the Internet?

Are you being served?

Having an office Internet link and locally hosted Web server is all very well, but what happens when the office staff's Web surfing activities consume all the bandwidth on that connection, causing server performance to drop dramatically? Generally, you get cheesed-off visitors. Then there are backup systems, media servers and tetchy CEOs all wanting priority on the network. One solution is to have separate Net links for critical services, but that costs a small fortune. A better solution is to use quality of service (QoS) systems that prioritise network traffic.

In most networks, packets of information are normally routed on a first in, first out (FIFO) basis. No packet is given special priority, meaning that urgent packets can get stuck in a queue behind packets that aren't. Nowhere is this more noticeable than in multimedia streaming. A few milliseconds' extra wait on that Web page is not going to make a big difference, but when downloading live video it makes all the difference: frames are dropped and audio skips.

QoS systems overcome this by reordering the packet output stream of routers and switches so that certain packets get priority, or making sure that there is a guaranteed level of bandwidth for a particular connection. Right now, use of QoS is rare, but in the future, when live streaming across both LANs and WANs becomes commonplace, it is likely to become extremely important.

There are a number of ways to achieve QoS. The first is to use protocols that explicitly indicate the priority of particular network packets, a simple solution that requires end-to-end support of those protocols. For Internet applications, these protocols are strictly necessary, as control of the network infrastructure ends at the edge of a private network.

However, a much simpler solution can be used for LAN-based QoS. Layer 4 switching or routing can be used to set up network policies for packet prioritisation — policies that the client systems need know nothing about. We'll examine each method in turn.

QoS protocols

There are a number of protocols for managing QoS, and the most common is the

Internet Engineering Task Force's (IETF's) Differentiated services (DiffServ) mechanism and RSVP protocol.

DiffServ is a feature that is already built into every TCP/IP packet but is rarely used. TCP/IP packets include a small number of bits that indicate the importance of those packets. These are called the Type of Service bits (in IPv6, they're known as Traffic Class bits). The problem is that those bits are never actually honoured by network providers (if they were, you could imagine every tweaker on the planet modifying their system settings so that every packet was signified with maximum priority). However, what ISPs and network providers can do is set up a list of 'trusted' sources and give the DiffServ bits in packets from those sources credence.

The Resource Reservation Setup Protocol (RSVP) is perhaps a more important mechanism for QoS over the Internet. RSVP is a standard that defines a system for 'booking' bandwidth on all the routing devices between two end points. When initiating an RSVP session, the end nodes figure out the routing path and ask each of the routing devices to set aside a certain level of bandwidth so that the packets can flow from end to end cleanly. The routing devices check whether the requesting node has the authority to set up such a connection (using an authentication protocol called Resource Allocation Protocol), and if so, will reserve that bandwidth.

RSVP, of course, is as poorly supported by most ISPs as DiffServ. Since most Internet traffic travels across multiple businesses' network infrastructures, maintaining link coherency, managing charges and ensuring bandwidth for RSVP connections across the Internet is a nightmare.

The Institute of Electrical and Electronics Engineers (IEEE) has also developed a protocol modification for



providing QoS information in Ethernet (layer 2) packets. Called 802.1p, the standard uses frame size modification to indicate that switches should prioritise certain packets. However, hardware supporting the standard is thin on the ground and its applications are fairly esoteric: a fully switched network rarely has need for QoS. It might be used to give priority access to a particular network resource, such as a server.

Layer 4 routing

For purely LAN-based traffic, it often doesn't make sense for end nodes to perform their own traffic and protocol management. A much simpler solution is to program the routing devices on the network to favour certain kinds of traffic. This approach does not exclude the specific protocol approach; routing devices can still be programmed to honour QoS protocols. However, they can be set up to prioritise packets based on much more information than this.

The term 'layer 4 routing' is a misnomer; layer 4, the transport layer, contains no addressing information,

therefore it's impossible to route packets based on that information. The reference to layer 4 applies to the use of some layer 4 information to prioritise and manage traffic.

A common example is the prioritisation of packets based on the TCP (a layer 4 protocol) port number. Every TCP/IP service has a default port number that identifies the application in use. HTTP, for instance, nearly always operates on port 80. Therefore, to prioritise HTTP packets, the routing devices need to go into the packets, read the TCP header information, and if the port is 80, prioritise the packet.

The TCP port number is not the only thing that can be prioritised. A routing device can also prioritise packets based on source or destination IP address (to give servers or managers special privileges), source or destination Ethernet MAC address, or even application layer features such as specific SAP functions.

Another feature of layer 4 devices is conditional routing. Some of these devices can be configured to use different network paths depending on the application in use. Imagine a company has two links between two offices: a low-latency landline and a high-latency satellite link. High priority packets could be routed through the landline, lower priority packets through the satellite connection.

All of these priorities can be set transparently by the network administrator,

software to modify their forwarding queues to prioritise certain kinds of packets. However, the sorting of packets can sometimes reduce packet throughput considerably. On many links this won't matter, as the router is often capable of throughputting many times more packets than the link can handle. A 10Mbps router on a 1Mbps link, for instance, can take a huge performance hit and still be able to use the full capacity of the wire.

More recently, we've seen the appearance of layer 4 switches, also known as layer 3 enhanced switches. Layer 3 switches, as discussed in Technobabble last year (see APC March 1999, page 132), are basically routers that use hardware chips instead of software (and they generally lack a WAN link). Layer 4 switches are the same, except they are capable of some QoS processing based on various levels of information contained in the packets.

Different routing devices approach prioritisation from different angles: some move the packets to the front of the queue, some have separate queues for different levels of priority. This can be important, as it may affect the 'degree' to which packets can be prioritised. For instance, a router might have two send queues: normal (N) and priority (P). Its packet delivery might have a sequence of P P P N P P P for high levels of prioritisation. For lower levels, it could shift to P P N P P.

QoS is not a magical bandwidth gen-

QoS is not a magical bandwidth generator. For every packet that is prioritised, another packet has to wait a bit longer in the queue.

erator. For every packet that is prioritised, another packet has to wait a bit longer in the queue. Often, the best solution is to get more bandwidth. At the LAN level, the incidence of QoS usage is quite low, simply because fast Ethernet is now cheap, and rather than trying to deal with complicated QoS routing on a 10Mbps network, it's frequently easier, cheaper and more effective to upgrade everybody to fast or gigabit Ethernet. Perhaps the most important application of QoS on the LAN is streaming media. For company-wide video announcements, for instance, it might be very useful. However, it will be a few years yet before most businesses get to the point of using streaming media to the desktop —

unlike QoS protocols that have to be explicitly initiated by the end nodes. The end stations needn't be aware of the network traffic-shaping policies set in place by the administrator. As long as all the routing devices involved in the transfer support the same set of priorities, there should be no problem. If you have a device capable of QoS, it can be configured using network management software. The important thing to remember is that this kind of QoS is a per-hop system; it's only useful if every hop along the way supports whatever protocols are being used to deliver it. When it hits a non-QoS device, all bets are off.

The first products to support QoS were routers, which could be reconfigured in

ATM

The best mechanism for achieving QoS over any size of network is probably asynchronous transfer mode (ATM), which was built from the ground up to support the features needed for quality of service. ATM natively provides various connection modes, or Classes of Service, which provide guaranteed levels of bandwidth.

ATM sets up a virtual circuit between two nodes, making it look more like a circuit-switched connection than a packet (or, more correctly, cell) based network. This virtual circuit can have varying characteristics, such as a fixed minimum or maximum bitrate.

Unfortunately, ATM has not taken off, and does not look like ever doing so, on the desktop at least. It is used in high-bandwidth network backbones, where its special characteristics are almost never applied. ATM is frequently used to route non-ATM packets using the Multiprotocol Over ATM (MPOA) system. It is possible to use a cut-through mechanism that takes advantage of ATM's Class of Service while running other protocols.

and by then, we may all have gigabit Ethernet to the desktop anyway.

QoS on the Internet

Attempts have been made to get QoS protocols happening across the Internet, particularly for media services. However, most attempts won't succeed as every node along the way has to support the QoS protocols in use, otherwise the stream will be broken. Many ISPs are currently talking about premium services for customers, but a universal agreement is necessary for it to work properly over the Internet. This is especially necessary for impromptu groups, for example, where people from all over the Internet log onto a Real Video broadcast.

Internet QoS might be achievable on a simple point-to-point system, such as a virtual LAN or a remote backup system. Often, companies use a single ISP for all their regional outposts, making the switch to QoS somewhat easier. QoS can be used if the ISP offers it across its backbone, but the ISP might charge a premium for it.

Nathan Taylor

For a complete archive of APC Core columns, see apcmag.com.



Nathan Taylor can be contacted at ntaylor@acptech.net.

Online auctions, mastering Dreamweaver
and automating your small business.

Dream a little scheme

eBay for Dummies

eBay for Dummies is one of the latest in the successful Dummies series published by IDG Books. You'll recognise the chatty writing style, the use of handy icons to draw attention to reminders, tips and warnings, and Rich Tennant's 'The 5th Wave' cartoons at the beginning of each chapter.

The authors assume little prior knowledge of online auctions. The first 20-odd pages explain what eBay is and how it works, before the processes, pitfalls and etiquette of online auctions are fully explored. The first chapter briefly covers what to consider if you are in the market for your first computer. This seems unnecessary, as anyone purchasing this book is likely to have a computer and access to the Internet already. Perhaps it's

just a convenient way of marketing other books in the Dummies series.

Like *eBay the Smart Way* (see right), this book is an excellent introduction to participating in and conducting

online auctions. It covers everything beginner buyers and sellers need to know. It also discusses privacy, security, and eBay's SafeHarbor Program (the customer service centre that handles complaints and issues warnings and suspensions for unethical behaviour).

eBay for Dummies is well structured and has a comprehensive table of contents that makes it easy to locate information. Like *eBay the Smart Way*, it uses screenshots for illustrating the functions of the site.

At \$29.95, this book is highly recommended for those new to the world of online auctions.

Cathie Kennedy

Authors Roland Woerner, Stephanie Becker and Marsha Collier

Publisher IDG Books

Contact Woodslane

Phone (02) 9970 5111

Price \$29.95

ISBN 0764506102

Rating ■■■■■■■■

eBay The Smart Way

This is a well-written, comprehensive guide. It takes you step by step through buying and selling through eBay, the online auction site that boasts 500 million hits per day.

eBay the Smart Way covers all the basics included in *eBay for Dummies*. It also has a section it claims is for advanced sellers, which covers using eBay as a marketing vehicle, building an electronic Web site and setting up an eBay business. However, each of these topics is worthy of a book in its own right, so the content lacks depth and detail.

eBay is an international marketplace, so it's disappointing that neither this nor the Dummies book addresses in any detail what needs to be considered when conducting business globally. Both

would benefit from chapters on issues such as tax, the differences in legal requirements, and organising international shipping and payment.

The book is published in the US, but the majority of the information is relevant to all readers.

Each chapter concludes with a short summary, which is useful when you are trying to find out where to locate particular information. The table of contents is comprehensive, but not as descriptive as that in *eBay for Dummies*, nor does it include a glossary for those new to computing and the Internet.

At \$36.95, *eBay the Smart Way* is a little more expensive than the Dummies book. Both provide a comprehensive introduction to what's involved in online auctions. The main difference lies in the writing style.

Cathie Kennedy

Author Joseph Sinclair

Publisher Amacom

Contact McGraw Hill

Phone (02) 9415 9899

Price \$39.95

ISBN 0814470645

Rating ■■■■■■■■

Dreamweaver 3 Bible

The *Dreamweaver 3 Bible* admits that Macromedia provides good help both within Dreamweaver and online, so it focuses on teaching techniques that aren't covered in the same detail.

The book is clearly aimed at Web site professionals; one of its first recommendations when deciding on Web site layout is to "gather as much information from your client as possible". So it's odd to find help for very basic HTML functions in the book. Has anyone with absolutely no idea of HTML ever been hired for professional Web site design?

Dreamweaver 3 Bible is massive at nearly 1,100 pages. Unlike in the next two titles reviewed here, Fireworks only gets a small amount of coverage. It's located in a section devoted to inserting multimedia files into sites. This isn't very good if you want to learn Fireworks

in detail, but it does allow for broader coverage of other elements that can be used on a page. The book also covers the software that comes with Dreamweaver (such as BBEdit and HomeSite) as well as Coursebuilder.

The accompanying CD has trial versions of Dreamweaver and Fireworks, along with other software, and a comprehensive series of Dreamweaver behaviours and command files.

If you use Dreamweaver 3, or are interested in learning to use Dreamweaver, the *Dreamweaver 3 Bible* is highly recommended. The learning curve is steep, but the rewards are considerable.

Alex Kidman

Author Joseph Lowery

Publisher IDG Books

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Rating ■■■■■■■■

EVERYDAY COMMANDS AND SWITCHES

The following list of commands shows some of the switches available for each command. All commands, filenames, directory names, usernames and passwords are *case sensitive* under Linux. Those commands requiring root access (see the *su* command) to operate are marked by **o**.

Navigation/file manipulation

[TAB] key	Command completion, the golden key.
[Up arrow]	Command history, the silver key!
ls	List files for the current directory.
ls -la	List all files in long format for current directory.
cd [directory]	Change directory.
mkdir [directory]	Create new directory.
cp [source] [target]	Copy a file to another file or directory.
cp -R [source] [target]	Recursively copy files and directories
mv [source] [target]	Move file, as with copy, but delete source.
rm [filename]	Delete a file.
rm -rf [directory]	Recursively and forcibly delete an entire directory structure.
cat [filename]	View file contents.
more [filename]	View file contents incrementally.
vi [filename]	Quick text editor to view/edit file contents.
locate [filename]	Find all instances of a file.
locate -u -e /mnt	Update the locate database for Linux system. o
ln -s [source] [link]	Create a symbolic link.
man [command]	View the manual page for a command.

Process management

ps x	Display current running processes.
ps aux	More informative <i>ps</i> display.
top	Automated process display.
kill [process id]	Kill specified process.
kill -9 [process id]	Kill stubborn process.
&	Append '&' after a command to background the process.

Administration

su [optional username]	Login as specified user. Defaults to logging in as root.
adduser [username]	Create a new account. o
passwd [username]	Change password of specified user. o
passwd	Change password of current account.
du	Report disk usage of files and directories.
df	Report disk free space for all mounted devices.
chmod [+rwx] [filename]	Change access permissions for a file.
e2fsck [device]	Run Ext2 file system check on specified device. o
rpm -ivh [RPM file]	Install a new application from RPM file. o
rpm -Uvh [RPM file]	Upgrade an existing application. o
rpm -e [program]	Uninstall an application. o
rpm -qi [program]	Query if an application is installed.
tar -zxvf [.tar.gz archive]	Untar and unzip a .tar.gz file.
shutdown -r now	Shutdown the Linux system immediately.

MOUNTING

Mounting is the process of attaching external file systems to the Linux file system hierarchy. If you wish to access other partitions on your system, or use removable media such as CD-ROMs and floppies, you'll need to use the *mount* command. Some Linux distributions automate the task of mounting and unmounting file systems in the X Window System.

Mounting involves specifying the file system type, the device to be mounted and the mount point:

```
mount -t [filesystem] [device] [mountpoint]
```

Available file systems include **iso9660**, **ext2**, **vfat**, **ntfs** and **smbfs**. A device can be any partition, CD-ROM, floppy or jaz drive, network file system and so on. The mount point can be any empty directory, usually created under */mnt*.

To unmount a device, use the command: **umount [device]**

Common uses:

Mounting a CD-ROM	<code>mount -t iso9660 /dev/cdrom /mnt/cdrom</code>
Mounting a floppy	<code>mount -t vfat /dev/fd0 /mnt/floppy</code>

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CONFIG FILES

/etc/lilo.conf	Configures LILO, the Linux Loader.
/etc/fstab	Configures automatically mounted file systems.
/etc/smb.conf	Configures Samba for Windows file sharing over network.s
/etc/modules	Specifies which modules to load at boot time.
/etc/X11/XF86Config	Specifies configuration options for the X Windows System.
/etc/hosts	Lists the names and IP addresses of other machines on a local network. Use to resolve names to IP addresses.
/etc/inittab	Edit the <i>initdefault</i> line to specify which runlevel to boot into. Use runlevel 5 (default for many current distributions) for a graphical bootup or runlevel 3 to boot to console.
/etc/rc.d/rc.local	Add any extra startup commands and programs here. The <i>rc.local</i> file is executed last in the bootup process.
/etc/cron.*	The <i>cron</i> directories hold scripts that are executed hourly, daily, weekly and monthly. Use to schedule applications to run at specified intervals.
~/bashrc	Configures options for the bash shell for your account.
/var/log/messages	Not a configuration file, but one worth keeping an eye on — everything that happens on your Linux system is logged here.

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FILE SYSTEM

/bin	Where binary (executable) files are stored. Can be found throughout the Linux file system.
/sbin	As with <i>/bin</i> , except for storing binary files to be used by the system administrator.
/boot	Bootup files, such as the kernel, are stored here.
/dev	The device directory holds files that represent devices, such as hard drives or soundcards, on the Linux system.
/etc	The <i>etc</i> directory and subdirectories store the majority of configuration files on a Linux system.
/home	Home directories for all user accounts can be found here.
/lib	The <i>lib</i> directory holds shared libraries used by various applications. Also found throughout the Linux filesystem.
/mnt	Attached file systems are connected to directories created here, such as CD-ROMs and floppies.
/proc	A powerful virtual file system containing files that represent various runtime aspects of a Linux system.
/root	Contains files belonging to the root user (the system administrator).
/usr	Used to store all user-based files.
/usr/local	The <i>/usr/local</i> directory is often used as a standard installation directory for user-installed applications.
/var	Contains files which change over time, such as spools and system logs.
/tmp	Used by the system and users to store temporary files.

USEFUL SITES

Linux.com www.linux.com	Linux.com is an excellent site for beginners to learn more about Linux and how to make the most of it. If anyone asks you what Linux is about, direct them here.
Linux HOWTO www.linux-howto.com	The Linux HOWTO page is one you should always keep bookmarked. The HOWTO documents will answer just about any question when it comes to configuring Linux.
Slashdot.org slashdot.org	The premiere news site for Linux users and IT enthusiasts in general. News for nerds. Stuff that matters.
Freshmeat.net freshmeat.net	Slashdot's twin, and focusing purely on new program releases, Freshmeat is another site to bookmark.
Themes.org themes.org	The only site you need to visit to spice up your desktop. Hundreds of themes are catalogued here for a variety of window managers.
Linuxberg www.linuxberg.com	Linuxberg is the Tucows for Linux. A well designed site that's easy to navigate and, with Australian mirrors, fast.
Australian kernel archive ftp.au.kernel.org	When you want to download the latest stable or development kernel fast, the Australian kernel archive is your source.



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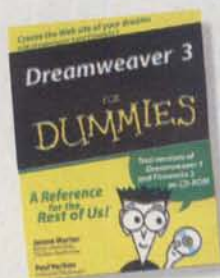
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Dreamweaver 3 for Dummies

Titles such as the *Dreamweaver 3 Bible* concentrate on being all things to all programmers, but *Dreamweaver 3 for Dummies* is aimed solely at beginners and those interested in dabbling in Web sites.

Layout is in the usual friendly Dummies style, but there are fewer illustrations and figures than you'd expect for a book aimed at HTML novices, and certainly a lot fewer than in *Mastering Dreamweaver 3*. Where the book excels is in the tips it provides. These promote the value of good colour design, cautioning beginners against flash over substance. A common outcome for those with powerful tools but little aesthetic sense is an overcrowded, busy effect. There's also a



chapter that covers specific examples of 'cool' sites created using Dreamweaver 3. Acknowledging that most great Web site ideas are evolutionary, not revolutionary, there's even a

chapter on how to easily adapt ideas from existing sites.

Dreamweaver 3 for Dummies includes a CD-ROM with demo versions of Dreamweaver and Fireworks, and given the target market, it makes good sense to include them. Beginners are less likely to own the software before investigating it, and it gives them the opportunity to trial and learn at the same time.

Dreamweaver 3 for Dummies is a good introduction to Dreamweaver. It's not much more than an introduction, but it doesn't claim to be. If you are already familiar with Dreamweaver, better books are available, but if you're merely curious, it's worth checking out.

Alex Kidman

Author J Warner and P Vachier
Publisher IDG Books
Contact Woodslane
Phone (02) 9970 5111
Price \$42.95
ISBN 0764506692
Rating ■■■■■■

Mastering Macromedia Dreamweaver 3

Mastering Macromedia Dreamweaver 3 is not just a reference for people familiar with Web design. It is also very good for anyone who wants to learn from the ground up. The book manages this balancing act by being heavily illustrated (good for beginners unfamiliar with the tools) as well as just plain heavy, at almost 850 pages. That's a lot to master.

Illustration is the key to this book; it's rare to turn a page without getting a screen capture of the function being described. Explanations are backed up with warnings about the overuse of features and the need to keep everything readable. Fireworks is



covered in more detail than in any other book reviewed here; just under half the book is devoted to it.

Like the other Dreamweaver books, a CD is included which has demo versions of Dreamweaver and Fireworks. It also has tutorial files for the book.

Mastering Macromedia Dreamweaver 3 provides very detailed explanations, and there are tutorials for almost every function. This is great for learning, but less useful for reference, as you need to wade through the tutorials to get to the function help.

If you're after a reference work, we recommend the *Dreamweaver 3 Bible* over this. If you're still learning, *Mastering Macromedia Dreamweaver 3* is a good choice. It has more substance to it than the equivalent Dummies title, albeit at a higher price.

Alex Kidman

Author David and Rhonda Crowder
Publisher Sybex
Contact Woodslane
Phone (02) 9970 5111
Price \$75
ISBN 0782126243
Rating ■■■■■■

Computers for Small Business: What You Need to Know

This book provides a simple but comprehensive introduction to computing for those with little or no prior exposure to PCs. However, at times the book is almost too comprehensive. For example, although it lists some useful programs such as desktop publishing software, voice dictation and email utilities, it also lists obscure utilities that are of no use to the beginner.

As this book is aimed at novices, the inclusion of more screenshots would have been welcome. Where screenshots do appear, they are not helpful. For instance, the screenshot for spreadsheets is simply a word count for the chapters in



the book. A sample balance sheet or profit and loss statement would have been more useful.

Similarly, the case study breakout boxes are disappointing.

A valuable appendix helps make sense of

specifications and introduces beginners to the jargon they will hear when making a purchase.

Computers for Small Business should come with a magnifying glass, as the unbearably small font and the tight leading make it difficult to read.

Despite its shortcomings, this book provides a sound introduction to business computing. However, there are better books on the market.

Cathie Kennedy

Author Richard Wentk
Publisher Choice Books
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Phone (02) 9577 3399
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The performance of your PC depends
on these basic components.

Speedy upgrading guide

Because PCs are modular, their subsystems can be upgraded individually. Here's a quick guide to what makes a difference in the four major subsystems: CPU, hard disk, RAM and graphics.

CPU

Swapping your CPU for one that's twice as fast won't double the speed of your whole computer, and it won't have any effect on tasks that aren't CPU dependent. For example, a super-fast processor won't make surfing the Internet any quicker if you're still connecting with the same old modem.

CPU prices are rather alarming once you get past the mid-performance level. As you'd expect, 700MHz CPUs are 40% faster than 500MHz CPUs of the same type, and at the moment they cost around 50% more.

However, as you move up the speed ladder, prices start to rise more sharply than performance levels. For instance a 900MHz CPU, which outperforms the 700MHz CPU by under 30%, is well over twice its price. Even worse, a 1,000MHz CPU, which is only 10% faster than a 900MHz CPU, is 70% more expensive.

There's a lot to be said for lower-priced CPUs like Intel's Celerons. You don't sacrifice a lot of performance and the money you save can be spent on other things.

Hard disk

Don't buy a new hard drive if what you need is more overall computer speed. The hard disk's contribution to the general performance of your PC is slight.

Modern operating systems use the hard disk in place of physical RAM (random access memory) when they need more memory than the computer has installed. So if you're running Windows, and you don't have

enough RAM for the programs you're running, you will notice a slight speed increase if you upgrade to a faster hard disk. However, the increase will only be from 'slow' to 'less slow'. You'll never get as much of a speed boost as you would by simply installing more RAM (see APC June, page 118).

If your hard drive's getting a bit full, you should be able to buy a new one and copy the data over (see APC January, page 116). Alternatively, you can set up a new drive in addition to the old one.

If you're doing very disk-intensive tasks like video editing or heavy database work, then a faster drive will help. If you don't need more storage space, your money is better spent adding more RAM.

RAM

When it comes to memory, quantity is more crucial than speed.

Current 133MHz frontside bus (FSB) Pentium IIIs have twice the memory bandwidth of old 66MHz FSB machines, but the performance difference for most purposes is far smaller than the benchmarks suggest. For this reason, even the fastest RAMBUS memory systems don't score much better overall than machines with the same CPU speed and slower RAM.

The level of memory a Windows machine needs depends on what you do with it, but some basic rules apply. Windows 95 and 98 performance is reasonable with 64M, and noticeably better with 128M. Adding more makes little difference in most instances. Similarly, Windows NT and Windows 2000 perform acceptably with 128M, but better with 192M or 256M.

Graphics card

If you're trying to increase your system's performance to get a better gaming experience,

you might be wise to upgrade your video card rather than buying extra RAM.

Your CPU and graphics card determine how many frames per second you get in a given resolution, for a given game. The CPU handles the geometry functions — figuring out what's where — and the graphics card turns that geometry into an image.

The CPU won't do any more work if you increase the resolution. That's the graphics card's department.

If you're using a fast graphics card and a low resolution, say 640 by 480, then a faster CPU will probably give you a better frame rate. No existing CPU can provide geometry data faster than top-end graphics cards can accept it in low resolutions.

There's really no point in upgrading your graphics card if it's already capable of processing everything your CPU can throw at it.

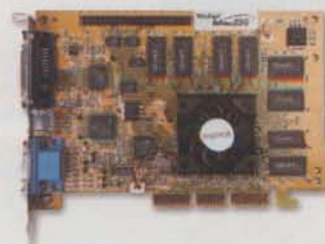
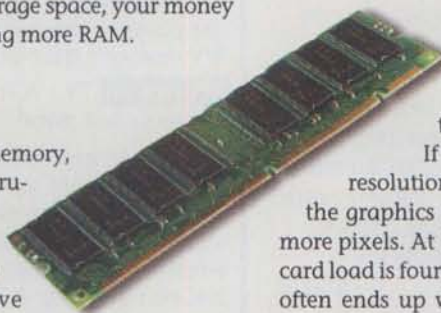
If you're running a higher resolution — from 1,024 by 768 — the graphics card has to generate a lot more pixels. At 1,280 by 960, the graphics card load is four times higher, and the CPU often ends up waiting for it. The load is doubled again if you run games in 32-bit colour for more realistic texture mixing.

When the graphics card is the limiting factor, a CPU upgrade won't help you.

It's easy to tell what your limiting factor is for 3D games. Just fiddle with the resolution. If turning the resolution down gives you a big frame rate boost, then a faster graphics card is what you want. If your frame rate is sluggish, and turning your resolution up doesn't make it much slower, then a faster CPU could be the answer.

We deal with system performance in more detail next month. Optimising your monitor performance deserves a column all to itself.

Daniel Rutter



For a complete archive of APC Step by Step columns, see apcmag.com.



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The name game

I've always hated the ugly and often forgettable email addresses that many of the people I write to are stuck with. Frankly, I can't be bothered remembering long and convoluted strings of routing instructions. These are particularly common in large companies and multinationals where long strings of subdomains, percent signs and underscores guide emails through routers and email servers across the globe.

Things become even less fun when people change ISPs or businesses, and I have to remember a totally new email address. Yes, I know email address books take care of this, but I'm not always near my computer when I write emails — and why should I have to work so hard to keep my address book current? Wouldn't it just be easier if everyone had a simple, easy-to-remember domain name?

Hoping to lead by example, late last year I bought my own domain name to get a simplified email address I could keep for life. Necessity also played a role in my decision: anticipating a move to broadband Internet services scheduled to come out this year, I knew my email address would change — and there was no way my ISP was going to forward the dozens of emails I receive every day.

Find yourself online

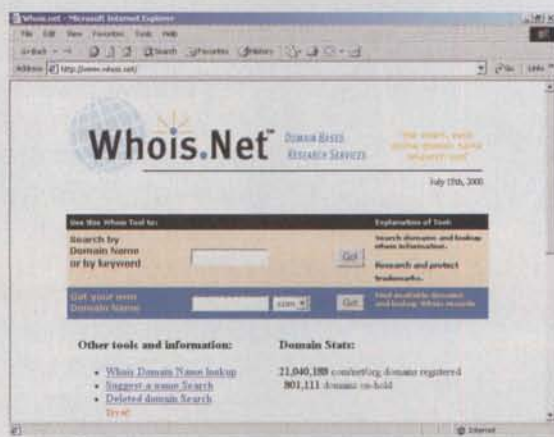
Registering a domain name in Australia can be something of a hassle, due to long-standing restrictions that limit .com.au ownership to legally registered business names. I couldn't justify the expense of going through the motions of registering a business name just to get braue.com.au.

If you're that keen, contact your state's business administration government department and find out how to go about registering a business name. But be warned: registering a trading name carries with it specific requirements, including (here in Victoria, at least) an obligation to display your trading name in a prominent location outside your place of business, ie. your home.

A much easier (and cheaper) solution was to get an address in the global .com domain, which is instantly recognisable

around the world and would also give me a shorter email address.

My first stop was to visit domain research site Whois.Net to see what domains were available. Fortunately, I have a relatively obscure surname that had somehow avoided the attention of cybersquatters, so braue.com was still available.



▲ Find out what domain names are available.

If your surname is more common, you might have to pay a domain speculator a rental fee to get your domain name. Visit yoursurname.com and see if you're directed to such a page. You might also try .net and .org variations, or look for alternative domains including your full name or middle name.

Full service registrars

The next step was deciding which domain name registrar I should go with. Registration normally costs \$US70 for two years, but to win over customers for more profitable, value-added services, some registrars have halved the price. Hoping to lock in customers for longer periods, many registrars now offer registration for up to 10 years, which can be a worthwhile investment if you're getting a personal domain name.

Almost all registrars now offer email and Web forwarding services, where they point registered domains at their own servers and forward all incoming email to customers' real, more complex email address. Similarly, Web forwarding is invaluable for setting up a Web site since it allows visitors to www.braue.com, for

David Braue wanted a truly memorable address, so he bought his own domain name.

example, to be automatically forwarded to the substantially more complex URL on the ISP server where my home page really lives.

If I needed more space for a Web page, I could also set up a home page on any of the hundreds of free hosting services, and use Web forwarding to direct all traffic to my dot com address to that service. Many registrars also provide 'sticky URLs' that give the illusion that you have your own Web server by tricking visitors' browsers into displaying your own URL instead of the real one.

When choosing a registrar, be sure to shop around; prices vary considerably, particularly for forwarding services. I finally chose NameSecure.com, which charges \$US24.95 a year for email and Web forwarding and has a self-service control panel that made it easy to change my real email address when I finally splurged on an Optus @Home cable modem service. As APC went to press, the best deal for domain registration and forwarding was through DomainDirect.com, which provides a full-service Personal Identity Account for \$US69.98 for two years.

A domain for life

I like to think that registering Braue.com has made life a bit easier for anyone trying to email me. The only problem I've run into was during Optus' widely publicised international bandwidth drought in June: as my email comes from NameSecure.com in the US, Optus mail servers weren't getting my email during the outage. This should improve when the Southern Cross undersea cable link is completed later this year, expanding international bandwidth.

Email and Web forwarding have otherwise worked seamlessly, and nobody ever forgets my email address any more. Now that it's both cheap and easy to set up email forwarding services — the whole process took me about an hour of research — it's a great way for anyone to secure their own little piece of cyberspace, for life.

David Braue

For a complete archive of APC Just DIY columns, see apcmag.com.



David Braue can be contacted at david@braue.com.



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Take advantage of Windows 2000's security features and resurrect corrupt icons.

Lock your windows

Last month, Workshop explored the user account and password features of Windows 2000. We continue our Windows 2000 security coverage with a look at how to encrypt folders and files, how to set permissions and how to ensure that your Internet connection is secure.

Converting to NTFS

The encryption and permission features of Windows 2000 require you to use the Windows NT file system (NTFS). If you've installed Windows 2000 using FAT or FAT32, converting your drives to NTFS is a simple procedure.

If you don't know which file system your drives are currently using, open Windows Explorer, right-click the drive and select Properties. Under the General tab you'll find what file system the drive is using. For the purpose of this article, the term 'drive' is used to refer to both individual physical drives and any partitions created on the physical drive. Almost all of the described tasks in this article require you to be logged on with administrator privileges.

To convert to NTFS, open a command prompt by clicking Start, Programs, Accessories, Command Prompt. Type in `convert X: /fs:ntfs`, where X is the drive that you want to convert. This initiates a number of tests and a conversion procedure that takes a little time, depending on the size of the drive. Repeat this procedure for every drive on your system.

Encrypting files and folders

Encrypting your sensitive data prevents other people from using it and makes the data useless to anyone who obtains it through theft of your hardware.

The Encrypting File System (EFS) is the file encryption technology used in Windows 2000. EFS provides transparent encryption, which means that there is no change in the way that you work with the encrypted objects if you are the person that encrypts them.

Enabling encryption is as easy as setting the attributes of a folder or file. All you have to do is right-click the folder or file and select Properties. Under the General tab you will find Attributes. Click on the Advanced button and then select the 'Encrypt contents to secure data' checkbox.

When you encrypt a folder you are asked if you want its subfolders and files

to be encrypted as well. If you encrypt an individual file you are asked if you also want to encrypt the parent folder. We recommend that you encrypt folders instead of individual files as many programs create new and temporary files when they are run. Unless the folder is encrypted then, any new files that are created won't automatically be encrypted.

A couple of folders that you might want to encrypt are the Temp folder, which programs use to store temporary files in (located in your Windows 2000 installation folder), and your My Documents folder.

Encryption prevents sensitive data from being viewed by others. Your encrypted files can still be deleted by other users if they have permission to do so.



▲ Click on the checkbox to encrypt the entire contents of the folder.

You may want to back up your encryption certificate in case of hardware failure or to access the encrypted data if you copy it to another computer. You can make a backup of your encryption certificate and private key through the Microsoft Management Console (MMC).

Open the MMC by clicking Start, Run, and typing in MMC. Add the Certificates Snap-in to the console for your user account. You will find the EFS certificate in the Personal folder. Right-click on the certificate, select All Tasks and then Export. This will start the Certificate Management Export wizard that takes you through the process of creating a password-protected PFX (personal exchange format) file.

Importing your certificate and private key to another Windows 2000 system is similar to exporting, except you select Import from the All Tasks menu.

One final thing to point out about Windows 2000 encryption is that it only

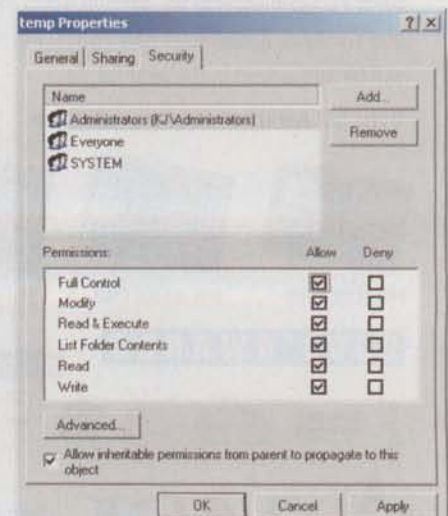
provides 40-bit protection. Until earlier this year, it was illegal to export 128-bit encryption technology outside of the US. Now that the US government has loosened these restrictions, the rest of the world can legally take advantage of the added protection that 128-bit encryption provides. This encryption is provided by installing the High Encryption Pack.

You can download the High Encryption Pack, which is less than 200K, from www.microsoft.com/Windows2000/downloads/recommended/encryption/download.asp. The conversion to 128-bit encryption will affect the encryption of folders and files along with other Windows 2000 components like Internet Protocol Security and Secure Sockets Layer. Installing the High Encryption Pack will also strengthen the security encryption of any Internet communications you conduct with secure servers to 128 bits.

Permissions

Access permissions allow and deny users access to certain folders and files. It is best to set these permissions on a per folder basis, or even on individual files. Setting permissions is a relatively simple task. The hardest part is preparing a list of who requires access to which folders and files.

To set the permissions of a folder or file, open Windows Explorer and right-click the folder or file you want to set permissions for. Open the Properties



▲ You can use the Properties window to set different permissions for each user.

Window and click on the Security tab. Here you can add users, and view a list of the permissions that they can be given. Six permissions can be granted to your users. These are Full Control, Modify, Read & Execute, List Folder Contents, Read, and Write. Some of these permissions only apply when combined with others. For example, you cannot allow Read & Execute without allowing Read at the same time.

You can refine what people can and can't do when using a particular folder or file. To refine someone's permissions, click on the button marked Advanced to access Special Permission, select their username from the list that appears and then click the View/Edit button. This produces an exhaustive list of options to describe what a user can and can't do to a file or folder.

Applying permissions to folders and files for each individual user can be very time consuming. Make use of group accounts so that you can set the permissions for a group instead of each individual. When new names are added to a group, they inherit whatever permissions are set for the group.

To put someone into a group, open Users and Passwords in the Control Panel. Click the username and then click Properties. On the Group Membership tab, click the group you want the user to be a member of and then click OK. To create a new group, click on the Advanced tab, then click the Advanced button under Advanced User Management. You can add new names and create your own groups in the window that appears.

One concept you need to understand when setting permissions is inheritance. By default, when you change the permissions of a parent object such as a folder, all existing child objects such as files and subfolders inherit those permissions. New files and folders that are created also inherit the specified permissions.

If the permission checkboxes in the security properties of a folder or file are shaded, that folder or file has inherited its parent object's permissions. You can change these permissions by clearing the checkbox labelled 'Allow inheritable permissions from parent to propagate to this object'.

If you want to prevent the permissions of a folder from being inherited by all of its child objects, you have to go to the special permissions window. In the 'Apply onto' pull-down menu, select 'This folder only' so that all of the folder's subfolders and files retain their original permissions.

Internet security

With the recent outbreak of denial of service attacks, virus scares such as the ILOVEYOU virus and the problems with sending credit card details over the Internet, many computer users are realising just how open and vulnerable they are when connected to the Net.

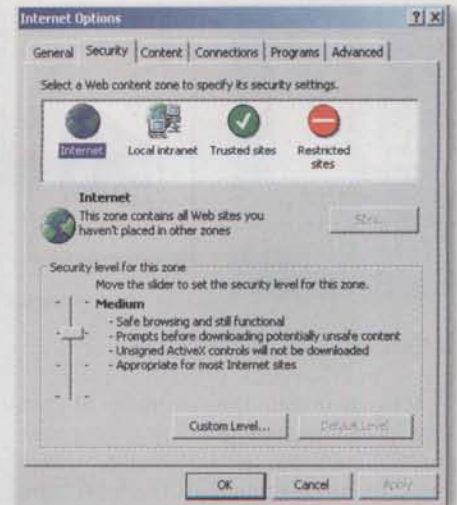
Windows 2000 has provided a number of features that increase Internet security. These include sophisticated network security features such as IPsec and Secure Sockets Layer. In most cases, these are best left in the capable hands of network administrators and professionals, but amateur Windows 2000 users can still minimise their vulnerability to Net-based attacks with a few simple techniques.

The first way to ensure that your Internet connection can't be maliciously used against you is to avoid opening it while logged on as administrator. If you are connected while logged on as Administrator, an intruder has the power to inflict far more damage to your system. For instance, they'd have the necessary privileges to reformat your hard drive or delete all your files.

You can also set security levels for different network zones that you conduct Web-based communication with. To set these security levels, select Internet Options from Internet Explorer's Tools menu. Under the tab called Security, you will find four icons representing different Internet zones. The Trusted Sites and Restricted Sites icons open interfaces that allow you to add URLs for those Web sites you either trust or wish to veto. The settings that you specify under Internet zone act as an ongoing policy for all other sites you come across when surfing the Net. The default level for the Internet zone is medium, but you may want to customise this level so that you control exactly how Internet Explorer deals with all Web sites. When you click on the Customise Level button, you can manually set how Internet Explorer will deal with things such as cookies, Java applets and scripting.

Those wishing to further increase their Internet security can install a third-party personal firewall application. Firewall applications monitor traffic entering and leaving the network ports on your system. They can filter Internet traffic very precisely, and block access to commands that might put your system in jeopardy.

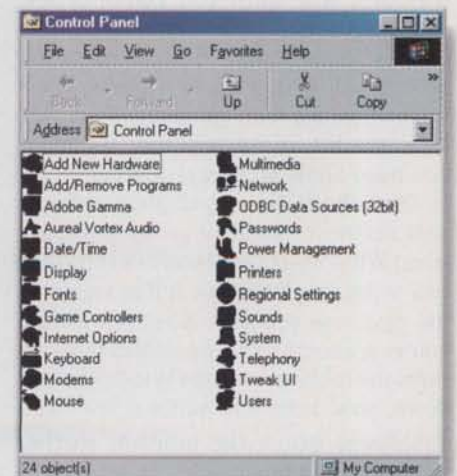
If a firewall interests you, try ZoneAlarm; it's free for personal and non-profit use. ZoneAlarm can manage security locally and across networks such as



▲ Keep your computer safe while surfing the Net.

the Internet. It allows you to define security zones that govern what kinds of communications can be performed. You can find ZoneAlarm in the Workshop section of this month's cover CD.

Resuscitating Windows 98's icons



▲ Figure 1

It's very annoying when Windows icons go bananas. Windows might still be working, but this doesn't mean it'll be 'easy' to use. There are a few common icon maladies that your system can suffer from.

- Your icons may suddenly turn black, as shown in figure 1 above.
- Your file type icons might become associated with an icon for the wrong class of file (figure 2).
- Or everything just ends up with the default Windows icon shown in figure 3.

By far the worst situation is where all of your icons are just a scrambled mess.



▲ Figure 2



▲ Figure 3

It's easy to treat the symptoms of your icon problems, but removing the cause can be much harder. Fortunately, many cases of icon corruption are caused by rare events. Once you know the cure, it's not too hard to fix.

When your icons go wrong, it's probably because Windows' cache file for them is corrupt. Windows uses a hidden file called shelliconcache to store the images for all system icons. It lives in your main Windows directory (x:\windows by default for Windows 95 and 98, x:\winnt under Windows NT 4 and Windows 2000). If something corrupts shelliconcache, your icons will be broken and will stay that way until you create a new cache file. This is easy to do. You need to be able to see hidden files, so go to the Tools menu in any folder window, select Folder Options then go to the View tab. From the list, make sure that the radio box titled Show All Files is selected.

Once that's done, find shelliconcache and delete it. Shelliconcache is rebuilt when Windows boots; if you delete it while you're running Windows, it'll be recreated the next time you start Windows. Even if you've got some ghastly problem that corrupts the cache every time Windows shuts down, your icons can suffer a few extra shutdowns before the problem reaches drastic proportions.

If you can't delete shelliconcache — for instance, if you're running NT4 or 2000 and you don't have the necessary privileges — there's still hope.

Go to Display Properties, choose the Appearance tab and select Icon from the Item pull-down menu. The size should be set to 32 by default, unless the Large Icons setting is turned on, in which case it'll be 48. Bump the size value up by one, and click Apply. When Windows has finished regenerating the newly sized icons, return the size value to its original figure and click OK.

Doing this will rebuild the shelliconcache entry for every icon that can be

seen with your current file view settings. The icons for system and hidden files won't be rebuilt if you've told Windows not to show them.

Icon corruption can be caused by all sorts of things. Sometimes the cause isn't clear; it just starts happening when your Windows installation gets old and crusty. It's one of the many signs that it's time to reinstall.

Determining the cause

Sometimes the icon cache can be corrupted by faulty video drivers, or a system crash at the instant when the shelliconcache file is being updated. Icon corruption can also be symptomatic of serious hardware problems; incompatibility, a defective hard drive or IDE controller, or an excessively overclocked processor are prime suspects in such situations. If this is the case, your icon corruption problems won't be solved for long, and they'll probably be accompanied by more serious system stability problems.

There's also a special case of icon corruption that is a known issue on the Microsoft support site. If you're running Windows NT 4 Service Pack 3 and your icons turn black, you have to install Service Pack 4 to remove the problem.

Some icon corruption problems — and slow window redraws — can be caused by having too many icons for the size of your cache. Windows has to start drawing them on the fly. You can increase the size of shelliconcache by using Registry Editor to create a new string called 'Max Cached Icons', with a large value like 2,000, in HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Explorer. However, it's easier to use a utility like ActivIcons from CursorArts to do it.

ActivIcons is a freeware utility that allows you to easily change the icons for just about anything on your computer, but it also allows you to rebuild the icon cache file, set the Max Cached Icons value, and modify various other things like the startup and shutdown screens, the text on the Start button and so on. Its interface is poor, but it works well enough and the price is right.

You can download ActivIcons from www.cursorarts.com/ca_aifw.html.

Kieran McNamee and Daniel Rutter

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Windows shareware

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For a complete archive of APC windows columns, see apcmag.com.

Introducing the...

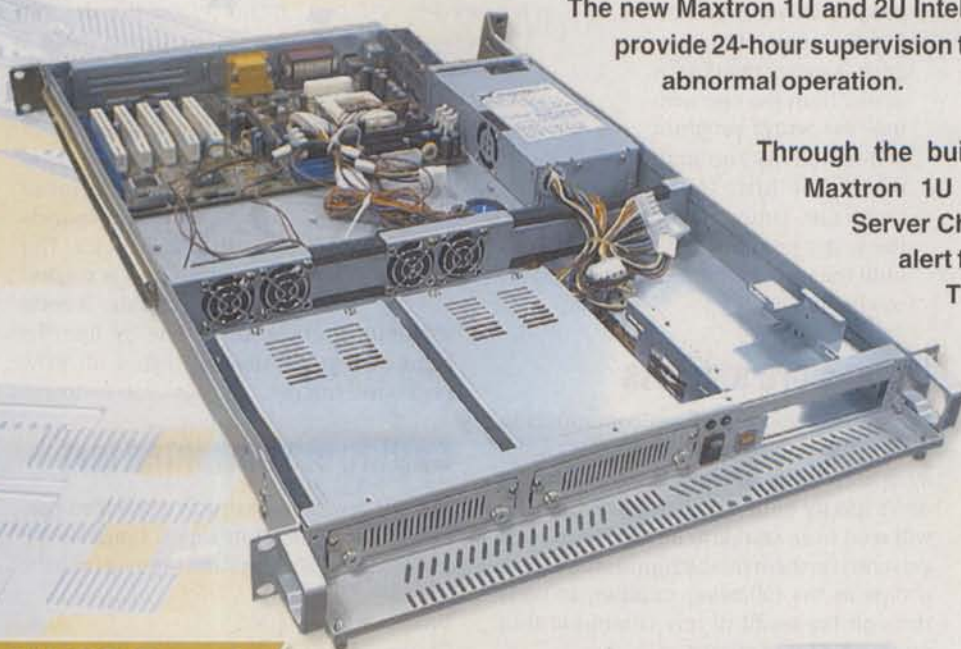
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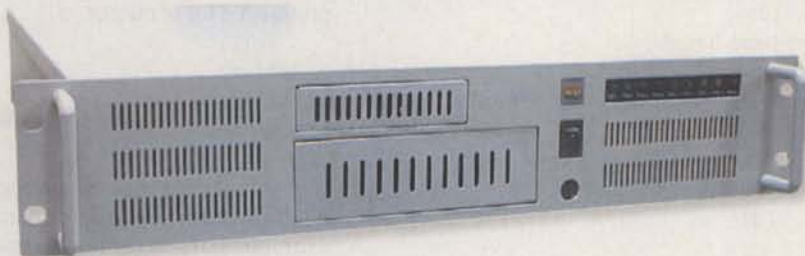
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How pipes can build complex operations
using simple commands.

Pipe dreams

This month looks at *pipes*, which connect the output of one program to the input of another. By making these connections, you can use various Linux commands as building blocks for more complicated operations.

Redirection and piping

To show how pipes work, we'll count the number of files in a directory two ways: using redirection alone and using a pipe.

To count the number of files in a directory, you need to use two programs.

- `ls -l` will give us a list of files (the `-l` option means list one file per line).
- `wc -l` will count the number of lines in its input (`wc` stands for word count, but adding the `-l` switch makes it count lines instead).

The following command counts the number of files in a directory using redirection alone.

```
ls -l > temp-filelist
wc -l < temp-filelist
15
rm temp-filelist
```

Doing the same thing with pipes looks like this.

```
ls -l | wc -l
15
```

Figures 1(a) and 1(b) show the flow of data through standard input and output, in the same format you used last month. For clarity, `stdin` and `stderr` have been omitted where they're irrelevant (for example, `ls` doesn't read from standard input).

As you can see from Figure 1(b), using the `|` character (known as a pipe or vertical bar) between two commands connects the standard output of the command on its left (in our example, `ls`) directly to the standard input of the command on its right (in our example, `wc`).

The most obvious difference between using redirection and pipes is that using pipes can save you a lot of typing. Other important differences are listed below.

- The programs can run simultaneously.
- A pipe doesn't use a temporary file, so the amount of data transferred between the two programs is not limited by the

available disk space. Also, if the first program doesn't finish, the second program will still run.

- Linux will maintain a buffer between the two programs communicating via a pipe. If the program reading the data is slower than the one writing, the writer program will not be held up until the buffer fills. If the buffer fills, Linux makes the writer program wait until the reader program catches up.

Using more and less

You can use `more` and `less` commands to view a file one page at a time, by typing `more <filename>` or `less <filename>`. If you don't specify a filename, these commands will read from standard input. This means you can use them on the right-hand side of a pipe in the following manner, to page through the result of any command that produces a lot of output.

```
ls -laR | less
ps aux | less
rpm -qa | less
```

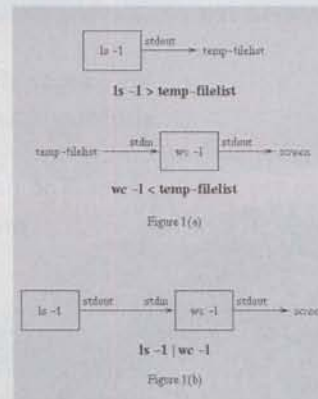
If one of the programs on the left of the pipe writes anything to standard error (for example, if the `ls` command encounters a directory it cannot read), the error prints to your screen directly instead of executing the `more` or `less` commands. To prevent this, you can redirect standard error to `/dev/null`, or to standard input. You just need to place the redirection before the pipe symbol as shown here.

```
ls -laR 2> /dev/null | less
ls -laR 2>&1 | less
```

Filters

There are many programs (called filters) designed to be used in pipe operations. They're called filters because they read from standard input, process it in some way, and then forward the result to standard output.

The simplest filter is `cat`. If used without any options it will copy its input to its output without change. By using its



▲ Figures 1(a) and 1(b): The difference between redirection and pipes

options, more useful tasks can be carried out. For instance, using `cat` with the `-n` option will number every line before printing it. To print a file with line numbers on the default printer, use `cat -n myfile | lpr`. To view the other available options, type `man cat` to view its manual.

A 'pipeline' can also be made by linking more than two commands together with pipes. The `sort` command is a good example of this. It sorts

its input *alphabetically, line by line*. To print a sorted, numbered list of all RPM packages, run `rpm -qa | sort | cat -n | lpr`.

Cutting out unwanted text

The `cut` command extracts a specified portion of each line of its input. Consider the following list of names and phone numbers.

```
Daniel,08 8543 2062
Charlie,08 9378 5652
Alice,02 9167 4289
Bob,07 4404 2335
```

To list only the names in this file, use `cut` as it is used in the example below.

```
cut -d , -f 1 phonenumber
```

The two parameters tell the `cut` command that only the first field is required, and that the fields are separated by commas (`d` stands for delimiter). To create a list of area codes instead, use two `cut` commands and a pipe.

```
cut -d , -f 2 phonenumber | cut -d ' ' -f 1
```

The first `cut` command extracts the list of phone numbers, and the second takes the phone numbers and extracts the area code portion.

To specify a field delimiter by character space, you need to put quotes around it. The `cut` command on the left has a filename argument (so it reads from that file), but the one on the right doesn't (so it reads from standard input). If you accidentally specified a filename to the second `cut` command, it would ignore its standard input and the expected result wouldn't occur.

The `cut` command is also able to extract on a character-by-character basis if your input doesn't have field delimiters. This can be handy for filtering the output of the `df` command. The `df` command will list all filesystems you have mounted, display how much disk space they are using, how much is left available, and the total (in kilobytes). A sample of the `df` output is shown below.

To see only the output of the column headed Available, limit the output to the character space ranging from 42 through 50, using `df | cut -c 42-50`.

Filesystem	1024-blocks	Used	Available	Capacity	Mounted on
/dev/sda1	50482	24641	23234	51%	/
/dev/sda3	402077	354382	26929	93%	/home
/dev/sda2	501125	395139	80105	83%	/usr
/dev/sda4	47543	34819	10269	77%	/var

Obtaining these numbers involves some trial and error, and the numbers might vary with different versions of `df`.

Removing duplicate lines

Using the `uniq` program, it's possible to distill a list of area codes from the phone numbers file, listing each one only once. The switch for the `uniq` program is `-u`. This example shows how it's used.

```
cut -d -f 2 phonenumbers | cut -d ' ' -f 1 |
sort -u
```

Once the input is sorted, the `uniq` program filters out any duplicate lines, and gives the same result as `sort -u`. The input needs to be presorted because `uniq` only ever compares adjacent lines (unless only adjacent duplicate lines need to be eliminated).

Finding matching lines

One of the most frequently used filters is `grep`, which looks for lines in input that match a supplied pattern. To find all people in the phone numbers file with an 08 area code, type `grep ,08 phonenumbers`.

The first argument to `grep` (after any options) is always the pattern to search

for. If you don't supply any filenames, `grep` will read from its standard input.

To search for a string containing a space or some other character that the shell considers special (such as `>`, `&`, or `$`), surround the pattern with single quotes.

The pattern you give to `grep` is called a *regular expression*. A regular expression is a concise way of saying things like 'find all lines with phone numbers beginning with 02 or 03'. Regular expressions are used in many other programs as well. For the moment the most important thing to remember is that to search for a `.`, `*`, `\`, `[`, `^`, or `$` character, you need to put a `\` immediately in front of the character (for example, for `*STARS*` write `*STARS*`).

Some switches that are commonly used with `grep` follow.

- `-i` ignores the case of letters (searching for bob would find bob, BOB, or Bob).
- `-v` inverts the search, so `grep` will display lines that don't match the pattern, instead of lines that do.
- `-A (number)` will display the given number of extra lines after a line that matches the pattern.
- `-e` can be used before the pattern to indicate the end of any options.

The command below can be used in a large phone numbers file to display lines that don't contain a comma separating the name and number. Two lines of context is displayed around each line.

```
grep -v , -A 2 -B 2 phonenumbers
```

For a list of files that match a particular set of permissions, use `ls -la` in conjunction with `grep`. For example, the command below lists the regular files that have all permissions granted to the owner, and no permissions granted to anyone else.

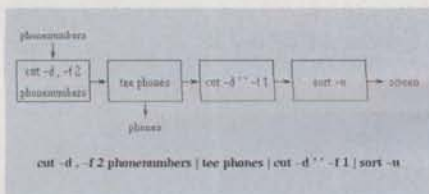
```
ls -la | grep -e '-rwx-----'
```

The `-e` switch is used to prevent `grep` from interpreting the `-r` as an option.

A T-piece in the pipeline

Occasionally it's handy to copy standard output into a file and have it appear on standard output. Do this with the `tee` command. To place our phone numbers in a file called 'phones' and view a list of unique area codes onscreen, type the following.

```
cut -d -f 2 phonenumbers | tee phones | cut
-d ' ' -f 1 | sort -u
```



▲ Figure 2: Using `tee` to copy standard output to a file

Linux freeware

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GNU GRUB

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Kannel

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A sleek-looking GUI bootloader and partition management system.


 All these packages can be found on this month's cover CD, along with more detailed reviews.

Figure 2 represents the flow of data created by the previous command.

The `tee` command is also useful for building a kernel. To see the results of the kernel build on the screen, and log all output (including errors) into a file, use this command line.

```
make bzImage modules 2>&1 | tee kernel-build-log
```

These 'compound commands', which combine various commands to perform jobs that can't be done with a single command, demonstrate Linux's flexibility.

Geoffrey Bennett

For a complete archive of APC Linux columns, see apcmag.com.

 Geoffrey Bennett can be contacted at geoffrey@netcraft.com.au.

A Penguin in the hand

Linux users can choose between several free third-party options to integrate Linux and their Palm PDA. This month, we cover some of the options available, how to set up the most commonly required communications settings and how to configure J-Pilot.

Choices

There are many free options available to synchronise your Palm Linux. Most current Linux distributions come with programs using either Gnome (www.gnome.org/gnome-pilot) or KDE (www.slac.com/pilone/kpilot_home) environments. These programs are Linux counterparts to synchronisation software for Windows and Macintosh computers. J-Pilot (jpilot.linux-ave.net) is an environment-independent application that runs under any Linux desktop environment. Its features, look and feel most closely resemble the Windows and Macintosh Palm synchronisation software.

What you'll need

To set up J-Pilot, the minimum requirements are Pilot-Link 9.0-, GTK+ 1.2 and J-Pilot .98, all of which are available on this month's APC cover CD. Pilot-Link is the Linux equivalent of the HotSync Manager program used by Windows. It manages the communications link between the Palm and Linux operating systems.

Although Linux has become much easier to use with new advances in graphical interfaces, J-Pilot, gnome-pilot and KPilot all set up the Pilot-Link software through the command prompt. Most current distributions of Linux come with Pilot-Link and the J-Pilot software.

If you are running Red Hat or Mandrake Linux and want to be sure you're using the most recent version of Pilot-Link, double-click on the pilot-link-0.9.0-3.i386.rpm and choose either install or upgrade, depending on what you're asked to do.

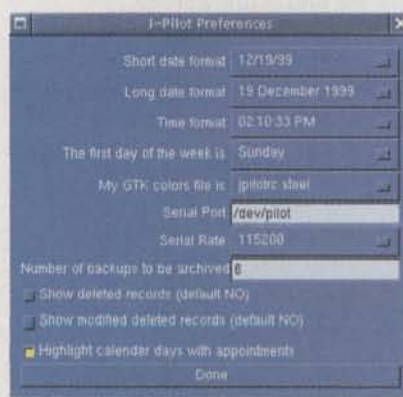
You can also install J-Pilot from this month's cover CD (look in the Workshop section) if you're not sure if you have latest version of it. Install the jpilot-0.98.1-2.i386.rpm if you're using Slackware, Red Hat or Mandrake, and jpilot-0.98.1-2.COL.i386.rpm if you're running Caldera Open Linux. The source files are included in case you have another distribution and want to compile it yourself.

Configuring Pilot-Link

First you need to tell Linux which serial port your Pilot is installed on. If the HotSync cradle is plugged into com1, the device name is /dev/ttyS0 (com2 would be /dev/ttyS1, com3 is /dev/ttyS2, and com4 /dev/ttyS3). If you're not sure which com port it's on, test the connection and make any necessary changes to make it work. You need to have root account privileges to do this, so log into the system as root if necessary before starting.

Begin by opening an Xterminal window by selecting the monitor icon on your taskbar. To set up your Palm device on com1 type `ln /dev/ttyS0 /dev/pilot`. Next, set the permissions on the port so the pilot-link software can be accessed by regular user accounts (not just root). Type `chmod 666 /dev/ttyS0`.

Finally, do a simple test to verify connectivity. Place the Palm into the cradle



▲ Figure 1: Setting the preferences for your J-Pilot

and press the HotSync button after typing `pilot-xfer -l`. If you've set up the correct port and it's securely attached to your PC, you will receive a list of databases and programs installed on the Palm. If you receive an error message like Unable to bind to port '/dev/pilot', try moving the cable to your other serial port or re-entering the symbolic link using another com port.

This configuration offers basic features, but at a very slow data transfer rate of 9.6Kbps. If you're running Palm OS 3.3 or higher, you can increase the speed to 115.2Kbps. Palm 3.0 or 3.1 work best at 57.6Kbps, and a Pilot Pro or lower should be set to 38.4Kbps. To check the version of your Palm OS, press the applications button, then the menu button, select the Info

How to make the most of your Palm PDA by integrating Linux.

PDA shareware

Palm OS

Astroids

Just like the original Asteroids we've come to know and love.

Action Names 4.53

A datebook, to-do list and address book replacement. Enhanced views, colour support and icons make this a handy all-in-one tool for keeping track of information.

ToDo PLUS 3.23

To-do list replacement that supports enhanced views, alarms and drawings, associated to-do items, and repeat to-do functions.

Preference Manager

Clears data and settings left behind by removed programs.

Windows CE & Pocket PC

ListPro 2.0

Customisable multilevel list and information manager.

Unit converter

Converts virtually any kind of measurement. Great for travellers.

ActiveSky Media Player

Watch a variety of videoclips.

QuickLaunch 4.0

Easy-to-use menu program to quickly launch your favourite programs.

Boyan's Crystal

Arcade game with great sound and graphics and 99 levels of excitement.

pull-down menu and press the Version tab. The system version will display in the upper left corner of your screen. The speed settings depend on a combination of your PC's capabilities and the Palm OS installed. Set them high and lower them if your Palm can't complete its synchronisation process. To set the speed, type export PILOT RATE="57600"

If this works, edit your .bashrc file to include this line so that it works every time you start up your computer. You can do this with any text editor in Linux; there are many to choose from.

If this is the first time you've synchronised your Palm device it will be necessary to configure the Username. If I wanted to set my Palm's user to Ron, I would type install-user /dev/pilot ron, then press the HotSync button on the Palm cradle. You can type install-user /dev/pilo without including any parameters to read this information back from the Palm. Multiple Palm devices can be supported, and this is how it distinguishes between them.

Setting up J-Pilot

Next, you need to set up J-Pilot to access your data. Many of the concepts we cover here also apply to KPilot and gnome-pilot.

To start, type the command jpilot at the command prompt. Next, go to the File menu and select Preferences (see figure 1).

Set the serial rate to 115.2Kbps, or whatever speed you specified in the PILOT RATE setting. Leave the other fields blank and close the Preferences window. You are now ready to synchronise your data. Double-click on the Sync button in



▲ Figure 2: Once you've set up J-Pilot, you can access your Palm from the desktop.

J-Pilot, and press the sync button on your Palm cradle. This will synchronise J-Pilot's datebook, to-do list, address book and notepad with those on your Palm device. The Palm databases will also be backed up and any programs that you elect to install will be copied to your Palm. If a record has been modified on both the Palm and the J-Pilot program, by default the synchronisation software will consider the Palm data the most current.

As Linux programs are frequently upgraded, it's worthwhile checking the Web sites listed at the beginning of this article for enhancements or upgrades.

Ronald Rosenbaum



Ronald Rosenbaum can be contacted at ron@ats.au.com.

For a complete archive of APC PDA columns, see apcmag.com.

WISAgenda 1.01

Integrated, easy-to-use agenda system merging built-in scheduling and task functions.

Psion

FreeMem

A memory defragmenter that reclaims resources and improves performance.

Asteroids 1.02

Psion's answer to the traditional arcade game with fast vector graphics and great sound.

5Talk 1.05

A talking alarm clock with adjustable settings for different times of day.

Balloon

A very simple game where you move a clown around to catch falling balloons. Great for young children.

MBMView 4.0

A picture viewer and editor compatible with colour or monochrome JPG, BMP, TIFF and all Epoch formats. Includes advanced features such as zoom, image rotation and a slideshow.



All these packages can be found on this month's cover CD, along with more detailed reviews.

[pb]
pocketbooks

EVERYTHING YOU NEED & NOTHING YOU DON'T

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*Hints, tips and tricks for using
FireWire and iMovie.*

Want to go to the iMovies?

IMovie, Apple's low-end digital video editing program, was originally only available as part of the software accompanying the FireWire-equipped iMac DV and DV Special Edition. Recently, Apple made it available as a free download from www.apple.com/imovie/download. A spokesperson for Apple told APC that the software is expected to be available on a CD-ROM in Australia in the near future.

Although the G4 and Apple's latest PowerBook — which Apple refers to as 'PowerBook (FireWire)' — are the only other models to provide a FireWire (IEEE 1394) interface as standard, it is possible to add FireWire to an older computer. If you have a Power Macintosh, you can install a FireWire-equipped PCI card (see APC June 1999, page 157) or a PC Card if you have a PowerBook. People using beige and blue-and-white G3s have reported success with iMovie, as have the owners of 7500/8500/9500 generation Power Macintoshes who have upgraded to G3 or G4 processor cards.

Getting ready

Before you begin using iMovie, there are several system software issues to consider. Although iMovie works with Mac OS from version 8.6, Mac OS 9's ability to handle bigger files and sustain a much larger number of simultaneously open files is an advantage.

Mac OS 9.0.4 (see asu.info.apple.com/swupdates.nsf/artnum/n11617) includes FireWire 2.3.3. This fixes a problem that causes some digital video (DV) camcorders to lose connection or crash the computer when importing video using applications such as iMovie. FireWire 2.4 (see asu.info.apple.com/swupdates.nsf/artnum/n1171) reduces the risk of a crash when a DV camera is unplugged while running iMovie. It also improves the performance of FireWire hard disks and extends the battery life on the PowerBook (FireWire) when no FireWire devices are connected.

As Apple indicates in Tech Info Library article 25125, iMac DV (Slot Loading), Power Mac G4 (AGP Graphics) and PowerBook (FireWire) systems can no longer play DVD movies after installing Mac OS 9.0.4, unless Apple DVD Player 2.2 is installed subsequently.

If for some reason you are staying with Mac OS 8.6 on a blue-and-white G3, the G3 Firmware Update 1.0.2 or 1.1 (see asu



▲ Individual clips are stored in the 'shelf' before being transferred into the timeline below.

info.apple.com/swupdates.nsf/artnum/n11361) should be installed before FireWire 2.4.

iMovie 1.0.2 is the first widely released version, but earlier versions were preinstalled on some iMacs. iMovie 1.0.2 has better audio quality, and like version 1.0.1, includes better Mac OS 9 compatibility and support for MP3 audio. It also addresses Y2K issues. In iMovie 1.0 and 1.0.1, a recording that spanned midnight on December 31, 1999, is automatically split into two scenes, and the date and time of material recorded after that time is shown as 'unknown date'. The 1.0.2 updater is available at asu.info.apple.com/swupdates.nsf/artnum/n11643.

Both iMovie 1.0.2 and DVD Player 2.2 require at least QuickTime 4.1, so you might need to update that too. QuickTime Updater will collect the necessary components from the Internet, or you can manually download a complete installer from www.apple.com/quicktime/download/support.

iMovie does not require QuickTime Pro, but upgrading to Pro does allow QuickTime-based applications to export files in DV format. This can also be done with QuickTime Player 2.5 if you still have a copy.

If you intend to use a minimal set of extensions when running iMovie to maximise the free memory and processor time, be sure to include Control Strip and Sound Manager, as they're required by iMovie. If you are using Mac OS 8.6, Navigation Services is also necessary.

One final piece of preparation: if you plan to record sounds from a source other than the DV soundtrack or an audio CD, make sure that the appropriate sound source is selected (in the Monitors & Sound control panel in Mac OS 8.6, or Sound in 9.x) before you try to launch iMovie.

Mac OS shareware

Bub & Bob 1.6.3

Bub & Bob is a platform game with many levels and adjustable game speed. Capture your opponents by blowing bubbles around them, but make sure you burst the bubbles before they float away.



Blobs 3.1.1

Arrange coloured Blobs on a game board so that adjacent like-coloured blobs merge, losing a link-mark in the process. When all link-marks are gone from a group, it explodes to make room for more play. Random 'specials' create or clear obstructions.

KKGames 1.0.6

These five simple but engaging learning games for preschoolers include spelling, musical note sounds and notation, arranging coloured objects to form pictures, and addition/subtraction games.

Mars Rising 1.0.2

This vertically scrolling arcade-style game has fast action, first-class graphics and stereo sound. Shoot Martians solo or with a mate without any bloodshed.

Meteor Storm 1.3

Defend yourself against incoming spacecraft, flying fragments and sundry space junk. This game features fully rendered 3D graphics and a good soundtrack.

Polyominoes 7.0

With several segments instead of just two, these dominoes can be rotated and positioned to fill an oddly shaped playing field. Last to position a piece wins.



All these packages can be found on this month's cover CD, along with more detailed reviews.

iMovie time

At last, it is time to start using iMovie. Apple has provided an excellent tutorial with iMovie (look under the Help menu), so APC has included a variety of hints, tips and techniques for you below.

After launching the application, select Preferences from the File menu, click on the Import tab, and ensure both the 'Automatically start new clip at scene break' and 'Imported clips go to shelf' options are selected. This is the default setting, and it greatly simplifies the task of acquiring video material from your camera.

The shelf is the area at the upper right of the iMovie screen that resembles QuickTime Player's Favorites Drawer (or a set of pigeonholes). This is the place where individual clips are stored prior to being transferred into the movie timeline at the bottom of the screen. Letting iMovie break the material into separate clips saves you from the tedious task of manually splitting the scenes, and saves wear and tear on your camera by reducing the number of times you have to start, stop and rewind the tape.

The only problem is the size of the shelf. If your display is set to 800 by 600 pixels, there is room for nine clips, but if you change it to 1,024 by 768, it expands to accommodate 12. If your system is capable of supporting a resolution of 1,600 by 1,200, you'll be able to fit 48. This increases your chance of being able to acquire all the video material you intend to edit at once.

If you know there are more than 12 scenes on the tape, deselect 'Imported clips go to shelf' and the scenes will go straight to the timeline. This creates more work in the editing stage, but saves time at the import stage. Scenes longer than approximately nine minutes will be larger than the 2G file size limit of Mac OS 8.6, and are automatically split.

If you are running Mac OS 9, an undocumented option is modifying the iMovie Preferences file (in the Preferences folder within the System Folder). Open it in SimpleText or another text editor, and change the value following AutoSceneDetectMaxBytes from 2042880000 to a larger value, such as 3404800000 for scenes up to about 14 minutes. Disabling virtual memory is said to cure some audio distortion problems, and others are reportedly cured by changing the FilterAudio value in this file from 1 to 0.

Transitions and titles

Don't be tempted to add transitions from one scene to another until you are happy with the rest of the editing. Applying a transition can be time consuming, so you don't want to repeat it just because you decide to add or remove a scene.

Some Mac and Windows users put too many different fonts in a document. There's a risk of making the same mistake with transitions and titles. If you use too many of the options, the result is unimpressive. Next time you're watching a TV program or a movie, observe how the pros do it. You'll also find a useful tutorial on transitions and titling at www.apple.com/imovie/gettingstarted/markstutorial.

Importing QuickTime movies



▲ You can add a black border to your movie to avoid problems with rescaling.

The first step in loading a QuickTime movie into iMovie is to convert it into a DV stream. Open it in QuickTime Player (with QuickTime Pro) or QuickTime Player 2.5, choose Export from the File menu, and select Movie in the Export pop-up menu. In the Use pop-up, select PAL 48kHz, then navigate to the required destination folder and click Save. If you move the DV file into the Media folder within an iMovie project folder, the next time you open that project, iMovie will ask if you want it added to the shelf. Click OK, then work with it like any other clip.

DV files are much larger than normal QuickTime files. A sample movie we used was over 40 times larger when exported to a DV file. This is due mostly to the fact that the original 240 by 180 pixel movie was

rescaled to 768 by 576 pixels. This has the unfortunate effect of making the picture look blocky. (You may see references to 720 by 480 pixels, but those dimensions are only applicable to the US NTSC format, not PAL). If you have movies of similar pixel dimension to convert, you can avoid the blocky effect by putting a black border around the movie that brings the view dimensions to 768 by 576. That way, when you export the entire movie in DV format, the original dimensions of the viewing area will be maintained rather than rescaled.

To create the border, open a 768 by 576 pixel image in an application such as Photoshop, fill it with black, and save the file in PICT format. Import that file into QuickTime Player (QuickTime Pro) by using Open Image Sequence from the File menu.

In the resulting Image Sequence Settings dialog, set Frame rate to 10 seconds per frame. This gives you a 10-second black screen. To get the black screen to the right duration, select all (Command-A), copy (Command-C) and then paste (Command-V) repeatedly. We found it best to make the black screen slightly longer than the nominal length of the movie. This removes the risk of the background flashing to white in the last frame.

Now open the QuickTime movie that you are going to frame. Select All, Copy, then switch to your black frame and ensure the black diamond is at the extreme left end of the progress bar. Hold down the Option key and select Add from the Edit menu. This superimposes the movie on your black screen, but positions it at the top left corner. Choose Get Info from the Movie menu, then select

Video Track 2 in the left-hand pop-up menu and Size in the right-hand one. Press the Adjust button, then drag the movie into the centre of the black screen. Once you've got it in the right spot, press Done. If you want to trim the duration of the black screen so that it exactly matches the movie, choose Select None from the Edit menu, then drag the black diamond to the extreme right of the progress bar. Hold down the Shift key, then press the left arrow key once. This selects the portion of the black screen that extends past the movie itself. Release the Shift key, and press Command-X (cut). Now you can export the entire movie in DV format.

You can find more iMovie resources on this month's cover CD.

Stephen Withers



Use multimaps to overcome the limitations of maps.

Going further with maps

A map allows you to map a key to a value, using a convenient array-like notation. Listing 1 shows a simple program which maps an author's name to their book. The statement `cat["Smith"] = "Practical C++";` maps the key 'Smith' to the value 'Practical C++'.

This program is limited, as a map can only contain one entry for each key. Obviously an author may have written more than one book. To deal with this, you can use a *multimap*. A multimap is a special case of a map, which allows duplicate keys. Unfortunately, this means that you can't use the array-style notation of the map. If you add the line `cat["Smith"] = "Simple ALGOL 68";` to your current collection, it is unclear to the compiler whether to add a second entry for Smith, or to alter the value associated with the existing key. Instead, you have to use the `insert()` method.

Listing 2 shows part of the modified program (you can find the full program on this month's cover CD). You initialise the map using the `insert()` method. This function takes a single argument of the type `multimap<string, string>::value_type`. Because this is long and cumbersome, typedefs are used to simplify it. Create a type `catalogue_t` equivalent to `multimap<string, string>`, and then `book_t` equivalent to `catalogue_t::value_type`. The typecast `book_t("key", "value")` creates a temporary `book_t` object out of the two strings, and this is passed to the `insert()` method.

Now, using a plain map object, you can output the book written by Smith simply by

including `cout<<cat["Smith"];`. This does not work with a multimap, as there may be more than one book for a particular author. The multimap provides a method `equal_range()` for this purpose. The `equal_range()` method returns a pair of iterators. The first points to the beginning of the range and the second to just beyond the end of the range. Listing 3 illustrates the use of this. If there are no keys with the requested value, the first will equal the last.

Keeping order

In these examples, the keys are always sorted in increasing order. The map template provides a way to customise this, using predicates (Boolean function objects).

A *function object* is an object that behaves like a function. The object overloads the `()` operator, so that its usage even looks like a function. A *predicate* is a function object which returns a Boolean (true or false) value. The C++ STL provides a variety of predicate templates, such as `less`. For example `less<int>(2, 4)` will return true, as two is less than four.

This map template accepts an optional third argument, a predicate to control the ordering of keys. The declaration `map<string, int>` is equivalent to `map<string, int, less<string>>`. As you've seen before, the space between `less<string>` and `>` is required. Otherwise the compiler confuses it with the `>>` operator. If you substitute

the predicate `greater` for `less`, you see the keys sorted in reverse order.

You can also create your own function objects to provide specialised ordering. Listing 4 shows an example of a function object, creating your own version of the `less()` predicate. Function objects are usually derived from either the `unary_function` or `binary_function` classes, where the 'unary' or 'binary' part indicates how many arguments the function should have. As with all

function objects, the `myless` class overloads the `()` operator, so you can call `myless(a, b)`, and it behaves as if `myless` was a normal function. Listing 5 implements `myless()` as a template, so it can operate on any data type for which the `<` operator is defined.

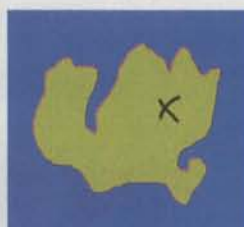
Creating a function object with identical behavior to a standard

STL function object is not very useful, but you can create specialised function objects which perform more complex operations. A simple example of this is comparing strings ignoring case, instead of the case-sensitive comparison performed by the `<` operator. Listing 6 implements this simple object.

Of course, the key of a map does not have to be a simple type. It may be a form of complex data structure. In this case, you can generate a more complex function object to produce the desired ordering. Listing 7 illustrates a function object which operates on structures.

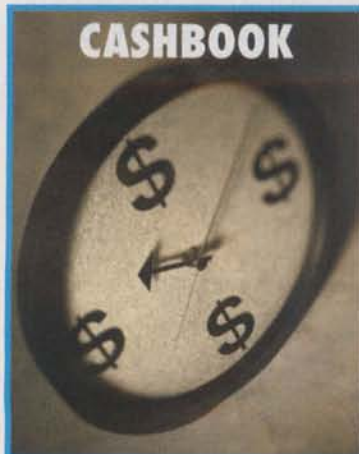
Next month, we look at sets.

Michael Smith



For a complete archive of APC C++ columns, see apcmag.com.

Michael Smith can be contacted at emmenjay@zip.com.au.



IT finance news as it happens

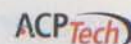
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C++ source code

Listing 1

```
#include <iostream>
#include <map>
#include <string>
using namespace std;

int main()
{
    typedef
        map<string, string>
        catalogue_t;
    catalogue_t cat;
    catalogue_t::iterator i;

    cat["Smith"]="Practical C++";
    cat["Lippman"]=
        "C++ Primer";
    cat["Stroustrup"]=
        "The C++ Programming"
        "Language";
    cat["Tolkien"]=
        "The Lord of the Rings";
    cat["Greer"]=
        "The Female Eunuch";

    for (i=cat.begin();
        i!=cat.end();
        i++)
        cout << i->first
            << '\t'
            << i->second
            << '\n';

    return 0;
}
```

Listing 2: Author.cpp

```
#include <iostream>
#include <map>
#include <string>
using namespace std;

int main()
{
    typedef multimap
        <string, string>
        catalogue_t;
    typedef
        catalogue_t::value_type
        book_t;
    catalogue_t cat;
```

```
catalogue_t::iterator i;

    cat.insert(
        book_t("Smith",
            "Practical C++"));
    // Insert the rest of the
    // titles here

    for (i=cat.begin();
        i!=cat.end();
        i++)
        cout << i->first
            << '\t'
            << i->second
            << '\n';

    return 0;
}
```

Listing 3

```
pair<catalogue_t::iterator,
    catalogue_t::iterator>p;
p=cat.equal_range("Smith");

for (i=p.first;
    i!=p.second;
    i++)
    cout << i->first
        << '\t'
        << i->second
        << '\n';
```

Listing 4

```
class myless :
    binary_function
    <string, string, bool>{
public:
    bool operator()
        (const string& a,
         const string& b)
        const
        { return a<b; }
};
```

Listing 5

```
template<class T>
class myless :
    binary_function<T, T, bool>{
public:
    bool operator()
```

```
(const T& a,
 const T& b)
    const
    { return a<b; }
};
```

Listing 6

```
class myless :
    binary_function
    <string, string, bool>{
public:
    bool operator()
        (const string& a,
         const string& b)
        const
        {return 0 >
            strcmpi(a.c_str(),
                b.c_str());}
};
```

Listing 7

```
struct student {
    string firstname;
    string lastname;
    string address;
    // etc ...
};

class stud_comp:
    binary_function
    <student, student, bool>{
public:
    bool operator() {
        const student& a,
        const student& b )
        const;

    bool stud_comp::operator() {
        const student& a,
        const student& b )
        const
        {
            if (a.lastname==b.lastname)
                return a.firstname<
                    b.firstname;
            else
                return a.lastname<
                    b.lastname;
        }
};
```



All these listings can be found on this month's cover CD.

Enhance your applets by mastering the
use of fonts in Java.

Fonts of wisdom

If you've been following these tutorials, you will have come a long way since you started writing applets in Java. You can draw shapes on the screen, write messages, play sounds, load images and take in parameters from a HTML file. This month, you'll learn how to work with different fonts in Java.

A font is a typeface, just like those used in newspapers or APC. You will be accustomed to using different fonts in your word processing program. In Java, fonts are represented by instances of the `java.awt.Font` class. A `Font` object is constructed from a font name (such as `Serif`), a style identifier (such as `bold`) and a point size (such as `10`). Like any other object, you can create an instance of the `Font` object at any time, but it will only be meaningful if you actually apply it to a particular element being displayed.

Below are some examples of declaring fonts.

```
Font littleFont = new Font ("Monospaced",
Font.PLAIN, 10);
Font bigFont = new Font ("Serif",
Font.BOLD, 24);
```

You will be used to font names being things like `Arial`, `Garamond`, `Times New Roman` and the like. As Java was designed to run on as many different operating systems as possible, it does not use font names in this way. Rather, the names are symbolic and refer to a particular type of font which is then translated to a specific font on the executing computer by the Java interpreter.

There are five font variations available to you.

Serif

These fonts have serifs, often described as tails, at the edges of characters (for example, `Times New Roman`).

SansSerif

These fonts have no serifs (for example, `Helvetica`).

Monospaced

These fonts are nonproportional fonts where the letter `i` takes as much space as the letter `w` (for example, `Courier`).

Dialog

This is a font used for dialog screens, such as opening a file.

DialogInput

This is a font used for user input on dialog screens, such as typing in a file name.

The Java interpreter maps the font through a file called `fonts.properties`. This file will be found in the `lib` directory where you installed your Java development environment. This could be Sun's `JDK` or a different Java implementation like `Symantec Cafe` or `Borland JBuilder`.

There are three style identifiers: `plain`, `bold` and `italic`. These are constant values that belong to the `Font` object. You can apply both `bold` and `italic` to a font at the same time.

To actually use a `Font` object, you can specify it as an argument to the `setFont()`

up the exact same amount of space on one screen that it will on another. `FontMetrics` is useful for retrieving information about how your font is sized on a specific system.

The `Graphics` object has a `getFontMetrics()` method (see below), which gives us this information for the current font being used.

```
public void paint (Graphics g)
{
    FontMetrics fm = g.getFontMetrics ();
    ...
}
```

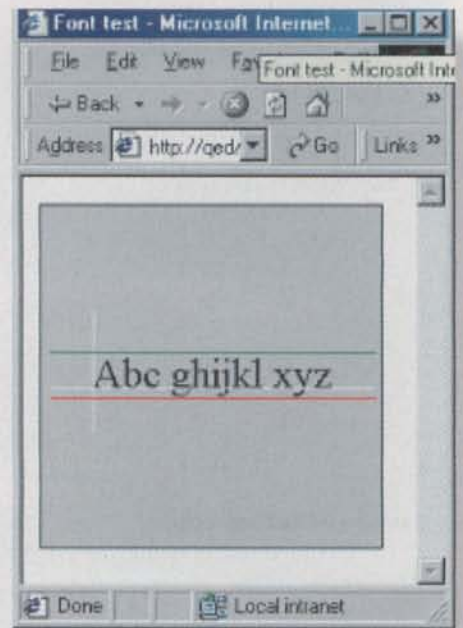
In this month's program, you will draw a word in a particular font and then draw reference lines showing cer-



▲ The white lines are the baseline axes of the font; the green line determines the maximum height of the letter; and the red line determines how far the letter can fall below the baseline.

method of any component — such as a button — or to an applet's `Graphics` object which is used to paint the canvas. Any subsequent text-drawing command for that applet, like `drawString()`, will use the specified font.

A second useful class is `java.awt.FontMetrics`. This object can give us detailed size and spacing information about text that has been rendered in a specific font. As different systems have different fonts, you can't presume that a word will take



▲ How your Web page will look after applying the above fonts to your applet.

tain characteristics. You will allow the word and the font name to be passed in to your applet as a parameter. These parameters are called 'word' and 'font-name' respectively. Try putting in different values in the HTML file and re-running the applet.

Your program might look a bit complicated, but there's not really much to it. Most of the code is in the applet's `paint()` method which sets the font, draws your word and adds a few lines to illustrate some of the font's metrics.

By default, text is rendered above and to the right of the coordinates specified in

Java source code

Listing 1: The FontShow Java program code

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;

public class FontShow extends Applet
{
    int LPAD = 25;

    public void paint (Graphics g)
    {
        String message = getParameter ("word");
        if (message == null)
            message = "computer";

        String fontname = getParameter ("fontname");
        if (fontname == null)
            fontname = "SansSerif";

        g.drawRect (0, 0, getSize().width - 1,
            getSize ().height - 1);

        g.setFont (new Font (fontname, Font.PLAIN,
            24));

        FontMetrics metrics = g.getFontMetrics ();
        int fontAscent = metrics.getMaxAscent ();
        int fontDescent = metrics.getMaxDescent ();
        int messWidth = metrics.stringWidth
            (message);

        int startX = (getSize ().width / 2) -
```

```
(messWidth / 2);
        int startY = (getSize ().height / 2) -
            (fontDescent / 2) + (fontAscent / 2);
        g.drawString (message, startX, startY);


        g.setColor (Color.white);
        g.drawLine (startX - LPAD, startY, startX +
            messWidth + LPAD, startY);
        g.drawLine (startX, startY + LPAD, startX,
            startY - fontAscent - LPAD);

        g.setColor (Color.green);
        g.drawLine (startX - LPAD, startY -
            fontAscent, startX + messWidth + LPAD, startY -
            fontAscent);

        g.setColor (Color.red);
        g.drawLine (startX - LPAD, startY +
            fontDescent, startX + messWidth + LPAD, startY +
            fontDescent);
    }
}
```

Listing 2: The HTML file to load the FontShow applet

```
< title>Font test< /title>
< /head>< body>
< applet code="FontShow.class" width="200"
height="200">
    < param name="word" value="Abc ghijkl xyz">
    < param name="fontname" value="Serif">
< /applet>
< /body>< /html>
```

 All these listings can be found on this month's cover CD.

the `drawString()` method. If that starting point is the origin of a coordinate system, then the axes are the baselines of the font. You draw these lines in white.

The greatest height the characters stretch above the baseline (for example, when using the letter l) is called the ascent, and is shown with a green line. Some fonts also have parts of letters that fall below the baseline (for example, when using the letter g). This is called the descent and is shown in red.

The `FontMetrics` object has `getMaxAscent()` and `getMaxDescent()` methods which yield this information. There is also a `stringWidth()` method which advises the width of the string when rendered in this font. These pieces of data can be used for centring your word horizontally in the display area. You centre it vertically by averaging the influence of the ascent and descent.


There are three other `FontMetrics` methods: `getLeading()` gives the vertical spacing between multiple lines in the font, `getHeight()`

gives the total line height (namely, ascent + descent + leading) in the font, and `getMaxAdvance()` returns the maximum character width of any character in the font.

That's really all there is to font handling in Java. Sun is working on a 2D graphics package with more font handling features, including portable fonts that can be used with a Java program regardless of the operating system.

David Williams

For a complete archive of APC Java columns, see apcmag.com.

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It's in the mail

In previous columns, Insite showed you how to use a text file as a data source to populate a Web page dynamically (see APC July, page 128) and investigated password-protecting Web pages (see APC August, page 142). This month, we combine these techniques and take them a few steps further by using Microsoft Access to create a simple database. Users will be able to enter data directly from a Web page in the form of a mailing list subscription. However, before you start building Active Server Pages, you need to create your database.

Build the database

Using Microsoft Access, create a new, empty database. Call it mailinglist.mdb and store it in a new folder called x:\Inet-Pub\Database (where x: is the name of the drive you use to store your databases). For security reasons, you should never store your database inside your Web site folder, as someone could download it.

Once you have created the database, you need to add a new table called mailingList. Select Table from the Insert menu and choose Design. In the Field Name column, create these fields: ID, name, email, dateCreated and status. Then, in the Data Type column, select the relevant data type for each field. For ID, select AutoNumber. Name and email should be text. The dateCreated field needs to be Date/Time, and Status should be Number. Finally, select the ID row and choose Primary Key from the Edit menu. The primary key is the unique identifier for each record in the database, so by assigning this to the autonumbered ID field, every subscriber will have a unique identifying value.

The information to be stored in the name, email and dateCreated fields is self-explanatory. The last field (status) will be used to determine whether subscribers in the mailing list receive emails or not. By allocating the number 1 to enabled subscribers and 0 to those who are unsubscribed, you can manage your database without having to delete records. This can be useful for seeing how many people are subscribing or unsubscribing from your mailing list. Now close your table and save it as mailingList when prompted.

Subscription page

The subscription page allows people to add their names and email addresses to your mailing list database. It has three form elements:

two text boxes (called name and email) and a submit button (shown in listing 1). Put this form in a page called subscribe.asp. The action for the form is subscribe_action.asp.

Insert a database record

The second page you need to create is subscribe_action.asp, which is entirely in VBScript. It takes the information submitted



in the form on subscribe.asp, inserts it into the mailingList table in the database, and then redirects the user to a 'thank you' page.

The first thing you need to do on this page is create a database connection. Do this by calling the createObject function. In July's Insite, you used this function to open a text file on the server. This time, instead of creating a File System Object, you need to create an ADODB Connection, which allows you to connect to a database rather than to a text file. When opening a text file with the File System Object, you need to specify the full path to the file. Because databases are more complex than text files and come in many different formats, you need to specify the name of the database driver required as well as the location of the database. Once this is done, you can instruct the database connection object to open the mailingList database (see listing 2).

Now that the database is open, you need to insert a new record. This is done using a database command language called SQL (Structured Query Language). SQL is a sophisticated language that can perform very complex database queries. Fortunately, our insert command is straightforward. It uses the following syntax.

```
INSERT into Table (field1, field2, field3)
VALUES (value1, value2, value3)
```

Create a database-driven mailing list
for your Web site with ASP.

In our case, the SQL command will look something like the one below.

```
INSERT into mailingList (name, email,
dateCreated, status) VALUES ('Daniel Potts',
'daniel@indigointeractive.com.au', '01-sep-00', 1)
```

The values for the name, email and dateCreated fields are enclosed in single quotes. This is because the Access database expects text strings as values for these fields. The status value is 1, which is our default, as it signifies that this subscriber is enabled. It doesn't have single quotes around it as the database requires a number for this field, not a text string.

Note that ID does not appear in the list of values in the SQL statement. This is because the ID field is of the type autonumber, which means that Access will automatically assign it a value. The default is to increment this value by one, so that the first record will have an ID of 1, the second will have a value of 2 and so on.

Before you execute the SQL insert statement, you have to modify it so that the form values submitted are inserted into it. Do this using the request.form() function shown in listing 3. The code has been broken up into multiple lines for easier reading.

The script in listing 3 uses the VBScript function Now() to insert the current date and time into the SQL statement. When this code is executed, it will look the same as the example SQL command above, except that it will contain information submitted by the user instead of my name and email address.

Now that you've opened your database and constructed the SQL statement, you need to instruct the connection object to execute the statement as shown in the first line of listing 4.

All that's left to do now is to close the database and redirect the user to a 'thank you' page. The redirection is performed using the response.redirect() function shown in listing 4.

Form verification with JavaScript

To prevent people from accidentally submitting incorrect information, a simple JavaScript function can be used to check that a name and email address have been entered into the form fields. The code to perform this verification is on the CD, and

Insite source code

Listing 1: The subscription form

```
<form action="subscribe_action.asp"
  method="post" name="subscribe"
  onSubmit="return checkForm()">
<table>
  <tr><td>Name</td>
<td><input type="text" name="name" size="30">
</td></tr>
  <tr><td>Email</td>
<td><input type="text" name="email" size="30">
</td></tr>
  <tr><td>&nbsp;</td>
<td><input type="submit" value="subscribe">
</td></tr>
</table>
</form>
```

Listing 2: Connecting to the database

```
set conn = createobject("adodb.connection")
DSN = "DRIVER={Microsoft Access Driver (*.mdb)}; "
DSN = DSN & "DBQ=C:\inetpub\database\mailingList.mdb"
conn.Open DSN
```

Listing 3: Dynamically generating SQL

```
SQLcommand = "INSERT into mailingList (name, email,"
SQLcommand = SQLcommand & "dateCreated,"
SQLcommand = SQLcommand & "status) VALUES ("
SQLcommand = SQLcommand & request.form("name") & "',''"
SQLcommand = SQLcommand & request.form("email") & "',''"
SQLcommand = SQLcommand & now() & "','1")"
```

Listing 4: Executing the SQL statement

```
conn.execute(SQLcommand)
```

```
conn.close
set conn = nothing
```

```
response.redirect("thankyou.asp")
```

Listing 5: Password-protecting your mailing list

```
<%
if request.form("userid") = "admin" and _
request.form("password") = "letmein" then
  logged_in = 1
else
  logged_in = 0
end if
%>
```

Listing 6: Looping through the database records

```
<% if logged_in = 0 then %>
<!--display the login form here-->
<% else
  set conn = createobject("adodb.connection")

  DSN = "DRIVER={Microsoft Access Driver (*.mdb)}; "
  DSN = DSN _
  & "DBQ=C:\inetpub\database\mailingList.mdb"
  conn.Open DSN

  SQLcommand = "select * from mailingList"

  set rstemp = conn.execute(SQLcommand)

  response.write("Copy the text below and paste ")
  response.write("into the BCC: field in your ")
  response.write("email: <br><br><pre>")

  do until rstemp.eof
    response.write(rstemp("email") & ",")
    rstemp.movenext
  loop

  response.write("</pre>")
  conn.close
  set conn = nothing
end if %>
```



For the complete code for all the pages used here, as well as the sample mailing list database, check this month's cover CD.

should appear in the header (<head>) information of your subscribe.asp page. It checks that neither form field is empty and that the email address field has an @ character in it. Make sure you call the JavaScript function by putting onSubmit="return checkForm()" in between your form tags (<form>).

An admin page to view your mailing list

Using code from last month's Insite, you can create a new page called listview.asp that checks for a username and password before displaying your mailing list. A simple modification sets a variable called logged_in to

either 0 or 1, depending on whether the username and password supplied were correct. Then, using an If . . . Then . . . Else . . . statement, check the value of logged_in, which will either display the login form or, if the login was successful, display the contents of the mailing list. To extract the mailing list from the database, perform the same operation on the database as you did when inserting a database record, except that the SQL statement becomes a SELECT-statement instead of an INSERT-statement (see listing 5).

Having used the asterisk wildcard to select all records from the mailingList table, you can loop through the recordset (named rstemp in the code) and display all the email

fields (see listing 6). Next month, we'll cover recordsets and ways of selecting and displaying database records. For now, this page will allow you to copy all the email addresses in your mailing list and paste them into the BCC field in an email. Alternatively, you can create a mailing list in your email software's address book that you can update from listview.asp. In next month's Insite we'll also look at ways of updating records in a database. Until then, if you need to unsubscribe people from your mailing list, you'll have to open the database in Access and manually set the status of unsubscribed users to zero.

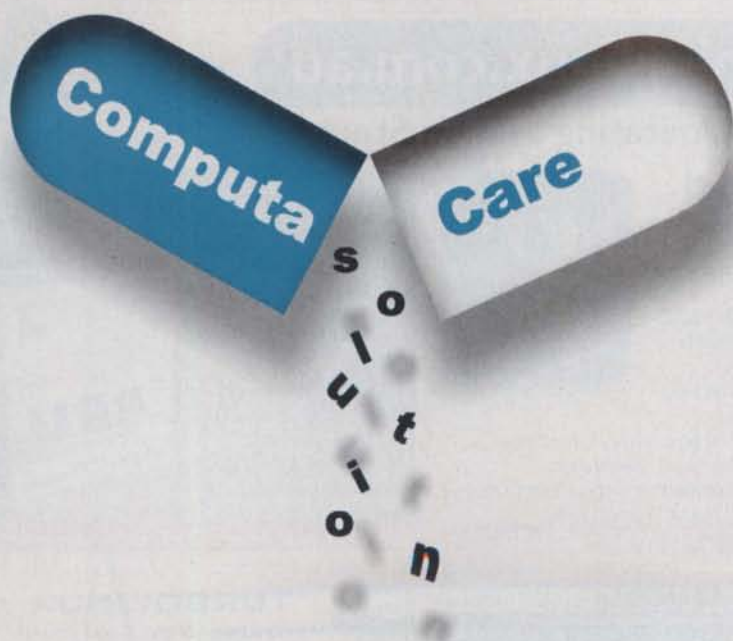
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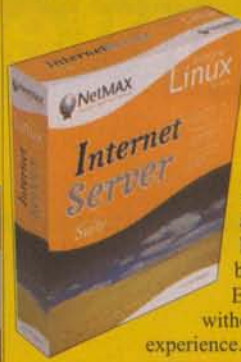
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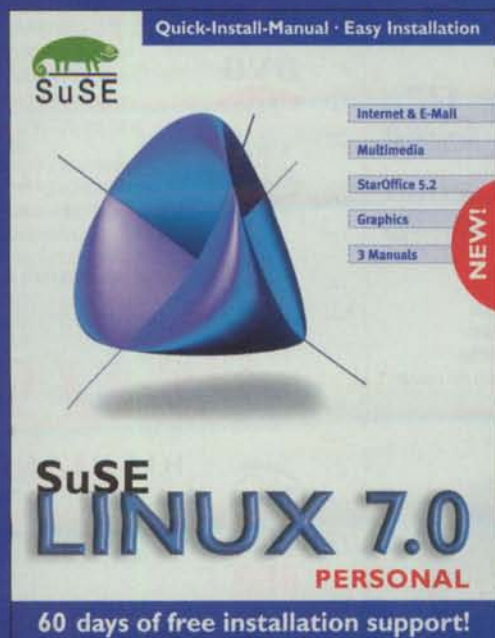
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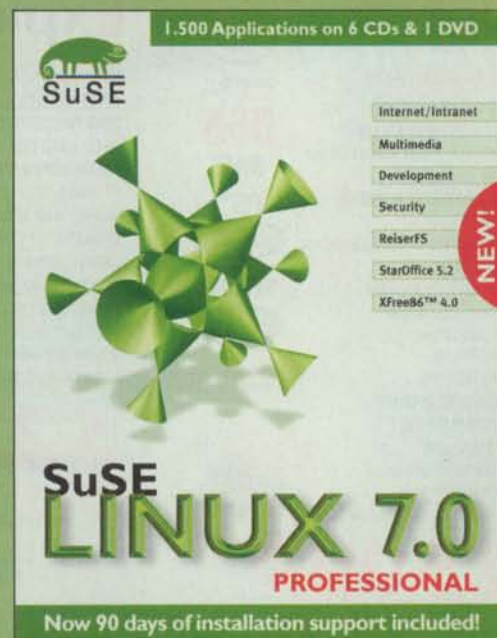
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CANON BJ-300/ 330	9	3-BKL
CANON BJC-600/610/620	7	4-BKL
CANON BJC-2000/4000/4100/4200/4300/4550/5000/5500 BCI-21	16	5-BKL
CANON BJC-2000/4000/4100/4200/4300/4550/5000/5500 BC-20	45	19-BKL
CANON BJC-3000/6000/6500	9	18-BKL
HP Desk Jet 400/500 Series	6	46-BKL
HP Desk Jet 600/660/690 Series	6	8A-BKL
HP Desk Jet 700/850C/855C/870C/890C/1000C Series	6	8B-BKL
HP Deskjet 300 Series & Olivetti JP's!	6	29-BKL
EPSON Stylus 400/800/800+/1000	8	7-BKL
EPSON Stylus Colour /PRO/XL	8	1-BKL
EPSON Stylus 820/colour II/IIi	8	2-BKL
EPSON Stylus Colour 200/300/400/500/600/800/850/1520	12	23-BKL
EPSON Stylus Colour 440/460/640/660/700/740/760/900	12	33A-BKL
IBM/LEXMARK 4076/1000/1020/2000/2030/2050 Series	12	33B-BKL
IBM/LEXMARK 5000/5700/7000 & Z Series	6	35A-BKL
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CANON BJC-600/610/620	3x12	25-CLR
CANON BJC-2000/4000/4100/4200/4300/4550/5000/5500 BCI-21	3x8	10-CLR
CANON BJC-3000/6000/6500	3x30	17-CLR
HP Colour Desk Jet 300/400/500 Series & Olivetti!	3x4	47-CLR
HP Colour Desk Jet 600C/660C/690C Series	3x12	14A-CLR
HP Desk Jet 850C/855C/870C/1000C Series	3x12	14B-CLR
HP Desk Jet 710/720/890 Series	3x3	30A-CLR
EPSON Stylus Colour /PRO/XL	3x3	30B-CLR
EPSON Stylus 820/colour II/IIi	3x4	16-CLR
EPSON Stylus Colour 200/300/400/500/600/800/850/1520	3x12	24-CLR
EPSON Stylus Colour 440/460/640/660/700/740/760/900	3x12	34A-CLR
IBM/LEXMARK 4076/1000/1020/2000/2030/2050 Series	3x6	34B-CLR
IBM/LEXMARK 5000/5700/7000 & Z Series	3x6	36A-CLR
CANON, EPSON, HP Fluorescent & Photo Realistic Kits!	3x6	36B-CLR
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HP Deskjet 970Cxi	\$696
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HP Officejet R45 4 in 1	\$862
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HP Laserjet 2100	\$1,313
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- Logitech 3 Button Mouse
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- Creative Sound Blaster Vibra Soundcard
- 480W PMPO Speakers
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- Creative Sound Blaster Live! Soundcard
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- 56K V90 Internal Voice/Fax/Data Modem
- Windows 98 on CD installed and configured

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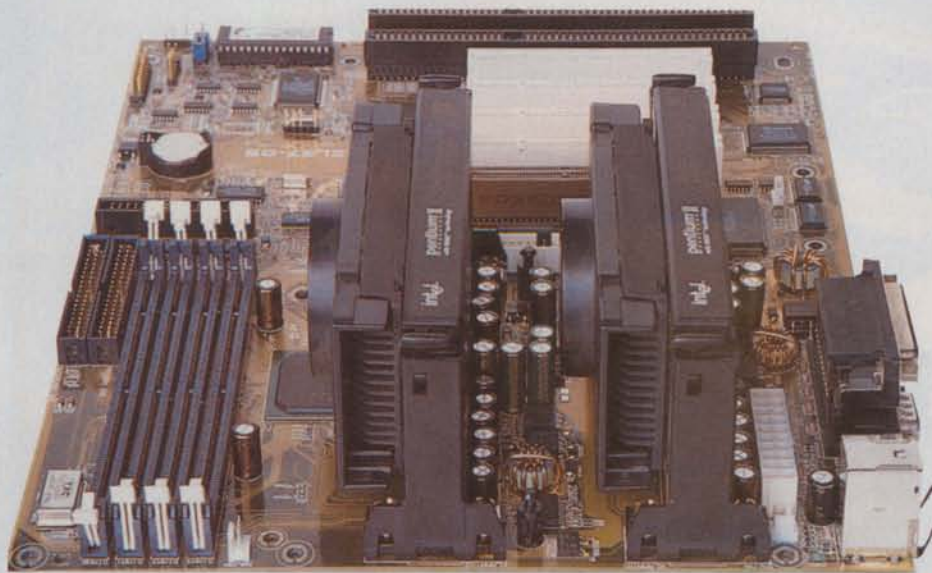
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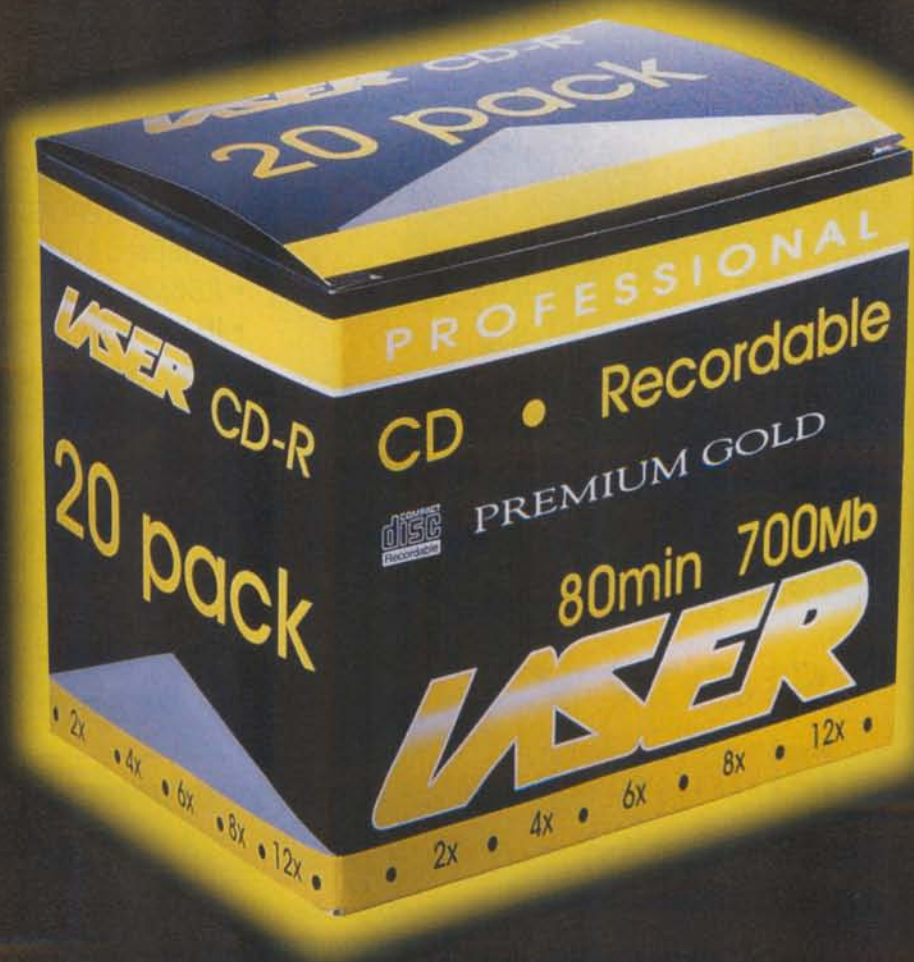


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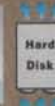
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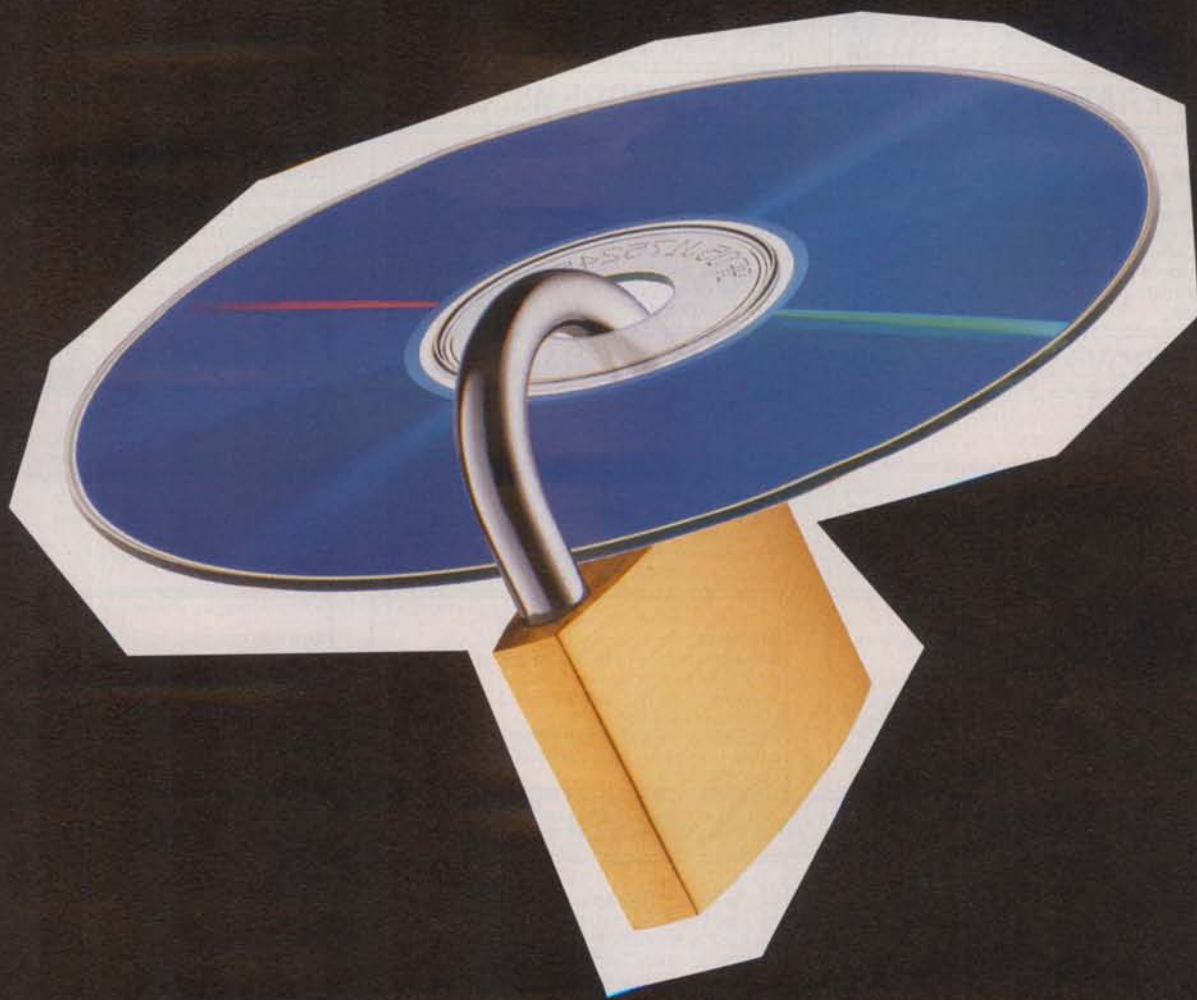
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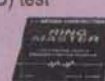
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- Windows98 SE CD

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Pentium III 667	\$1730
Pentium III 733	\$1790
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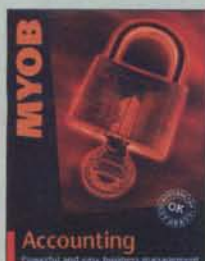
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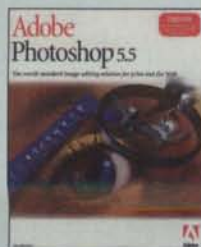


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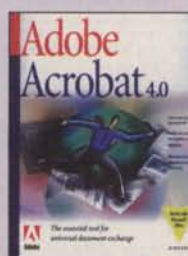
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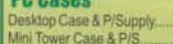
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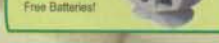
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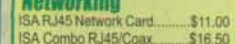
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9
7
16
45
9
6
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12
6
6
12

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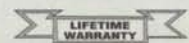
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		K25CLR	6
K7BK	60	K1CLR	30
K8BK	7	K2CLR	12
K4BK	9	K2CLR	12
		K23CLR	6
K9BK	7		
K10BK	16	K3CLR	8
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K12BK	9	K5CLR	30
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K28BK	12	K35CLR	6
		K36CLR	6
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		K15CLR	6
K13BK	12	K20CLR	6/12
K16BK	12	K7CLR	6/12
K14BK	12	K6CLR	12
K15BK	8	K6CLR	6
K17BK	12	K20CLR	6/12
K17BK	12	K8CLR	6
K17BK	12	K17CLR	6/12
K21BK	3	K34CLR	3
K26BK	12	K16CLR	6/12
K6BK	12	K16CLR	6/12
K6BK	12	K35CLR	6
		K33CLR	9/12
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CANON BJC4000/4100/4200/4550 BCI-21	30	C9
CANON BJC 7000	6	C16
HP DESKJET 400, 500 & 600 SERIES	12	H3/H5
HP DESKJET 820C/850C/855C/870C/1000C	6	H7
HP DESKJET 720/890/Officejet 1150	4	H14
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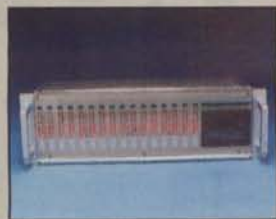
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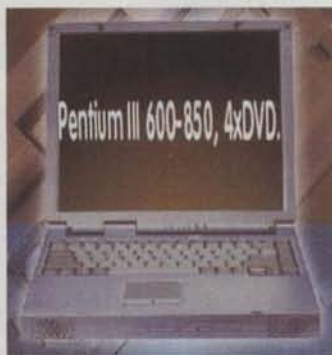
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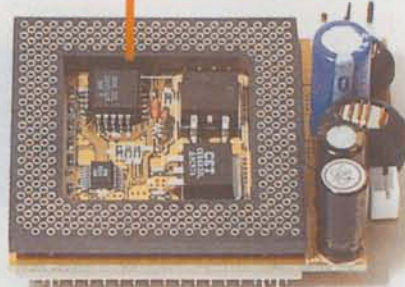
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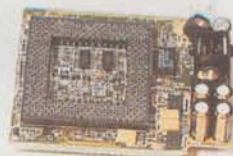
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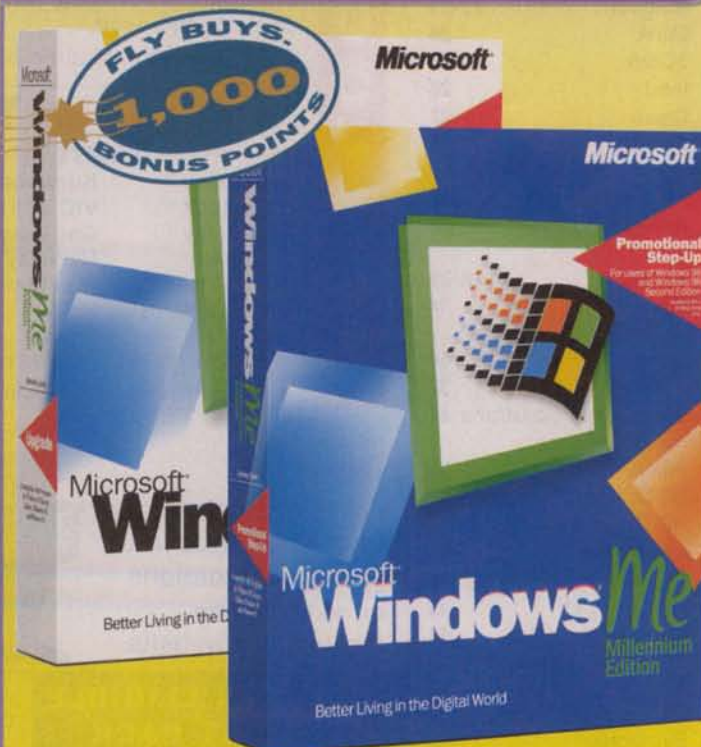
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Port replicator	No	No
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Hard Disk	6GB	12GB	12GB	12GB
Screen	13.3" TFT	14.1" TFT	14.1" TFT	14.1" TFT
CD-ROM	24xCD-ROM	No	No	No
Mic & Spkr	Yes	Yes	Yes	Yes
Port replicator	Optional	Optional	Optional	Optional
Video Ram	8Mb	8Mb	8Mb	8Mb
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Compare Tecra Models

	Tecra 8100	Tecra 8100	Tecra 8100	Tecra 8100
Processor	Celeron 600MHz	Pentium III 600MHzSS [#]	Pentium III 700MHzSS [#]	Pentium III 750MHzSS [#]
RAM Std/Max	64 MB	64 MB	128 MB	128 MB
Hard Disk	6GB	12GB	12GB	20GB
Screen	14.1" TFT	14.1" TFT	14.1" TFT	14.1" TFT
CD-ROM	24x CD-ROM	24x CD-ROM	24x CD-ROM	24x CD-ROM
Mic & Spkr	Speakers	Speakers	Speakers	Speakers
Port replicator	Optional	Optional	Optional	Optional
Select bay	Yes	Yes	Yes	Yes
DVD capable	6 x DVD	6 x DVD	6 x DVD	6 x DVD
Weight	2.8 kg	2.8 kg	2.8 kg	2.8 kg
Warranty	3 Years	3 Years	3 Years	3 Years
56K V.90 modem	Yes	Yes	Yes	Yes
RENT*	\$42.12	\$59.94	\$59.78	\$69.39
GST Ex + GST	\$4,700 + \$470.00	\$5,978 + \$597.80	\$6,264 + \$626.40	\$7,271 + \$727.10
GST INC	\$5,170⁰⁰	\$6,575⁸⁰	\$6,890⁴⁰	\$7,998¹⁰
With Windows 95/98	(A2860)	(94185)	(A2868)	(A2863)
RENT*	\$48.84	\$61.94	\$61.99	\$69.30
GST Ex + GST	\$4,871 + \$487.10	\$6,490 + \$649.00	\$6,495 + \$649.50	\$7,261 + \$726.10
GST INC	\$5,358¹⁰	\$7,139⁰⁰	\$7,144⁵⁰	\$7,987¹⁰
With Windows 2000/NT4	(A2862)	(94186)	(A2869)	(A2864)

Rent Smart

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Pentium® III available in some Tecra's

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	Portégé 3440CT	Portégé 7220CTe
Processor	PIII 500MHzSS#	PIII 650MHz
RAM Std/Max	64/192 MB	64/192 MB
Hard Disk	6GB	12GB
Screen	11.3" TFT	13.3" TFT
Display	1024x768	1024x768
CD-ROM	Optional	Optional
Mic & Spkr	Yes	Yes
Port replicator	Multi-media	Optional
Select bay	Optional	No
LAN	Yes	Optional
DVD capable	Yes	Yes
Weight	1.6 kg	2 kg
Warranty	3 Years	3 Years
56K V.90 modem	Yes	Yes
RENT*	\$39.95	\$57.78
GST Ex + GST	\$3,886 + \$388.60	\$6,054 + \$605.40
GST INC	\$4,274.⁶⁰	\$6,659.⁴⁰
With Windows 95/98	(99762)	(A2839)
RENT*		\$60.72
GST Ex + GST		\$6,362 + \$636.20
GST INC		\$6,998.²⁰
Windows 2000/NT4		(A2847)

Portégé 3440CT

Portege 3440CT offers Intel®'s powerful Mobile Pentium® III 500MHz processor with Intel SpeedStep™ technology to speed through applications. At 25mm thin and only 1.6kg, Portege 3440CT packs unprecedented power into its slender charcoal grey and silver magnesium alloy case.



*SS = Speed Step

Options for Toshiba Notebooks

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TOSHIBA EDO Memory Upgrades

32MB for Tecra 8000 (not for PIII models)/ Portégé7000/Satellite 4000	
GST Ex \$186 + GST \$18.60 (29356)	GST INC \$204.60
32MB for Portégé 3110	
GST Ex \$172 + GST \$17.20 (81078)	GST INC \$189.20
64MB for Tecra 8000 (not for PIII models)/ Portege7000/Satellite4000	
GST Ex \$223 + GST \$22.30 (29348)	GST INC \$245.30
64MB for Portégé 3020	
GST Ex \$362 + GST \$36.20 (77229)	GST INC \$398.20

TOSHIBA Battery Packs

For Satellite 4000/4010/2520CDT & others	
GST Ex \$108 + GST \$10.80 (21930)	GST INC \$118.80
For Portégé 3010/3020 (Lithium Ion)	
GST Ex \$124 + GST \$12.40 (73665)	GST INC \$136.40
For Satellite 4000 Series	
GST Ex \$108 + GST \$10.80 (72109)	GST INC \$118.80
For Tecra 8000 (Lithium Ion)	
GST Ex \$239 + GST \$23.90 (29358)	GST INC \$262.90

TOSHIBA High Capacity Battery Packs

For Portégé 3010/3020	
GST Ex \$235 + GST \$23.50 (72475)	GST INC \$258.50
For Portégé 7000/7020	
GST Ex \$281 + GST \$28.10 (66479)	GST INC \$309.10

TOSHIBA Battery Charger

For Tecra 8000	
GST Ex \$366 + GST \$36.60 (29357)	GST INC \$402.60

TOSHIBA Universal AC Adapter

For Tecra 8000/Satellite 4000/4010 & others	
GST Ex \$110 + GST \$11.00 (44200)	GST INC \$121.00

TOSHIBA Additional 2 Year Warranty

For Satellites with TFT Display	
GST Ex \$182 + GST \$18.20 (21729)	GST INC \$200.20

TOSHIBA Port Replicators

For Tecra II 750/780/8000	
GST Ex \$547 + GST \$54.70 (79226)	GST INC \$601.70

TOSHIBA Desk Station V+

For Tecra 8000 Series	
GST Ex \$855 + GST \$85.50 (84096)	GST INC \$940.50

TOSHIBA Carry Bags

Toshiba Friend Carry Bag	
GST Ex \$80 + GST \$8.00 (75901)	GST INC \$88.00
Leather Bag for A4 Notebooks	
GST Ex \$178 + GST \$17.80 (68408)	GST INC \$195.80



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Pavilion 8600 Series



HP Pavilion

Value-packed! Features-packed! Action-packed!

Introducing the latest HP Pavilion 6600 series, bringing you even more features and value in an exciting new design. It combines the reliable Intel Celeron processor and multimedia capabilities in a sleek three tone flint, slate and titanium chassis. The latest HP Pavilion one-touch multimedia keyboard is enhanced further to make Internet access to your favourite websites and e-mail, even simpler. And with free* Internet access, a world of the Internet is made even easier. And with preset functions from printing

to playing the latest CD's, the HP Pavilion 6600 makes home computing even more fun and exciting. So if you're looking for a user-friendly, affordable great all-rounder, you can't beat the HP Pavilion 6600 series. * Terms and conditions apply.

New Look. New Features.

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Sporting the futurising-looking Three-Toned Flint, Slate & Titanium Gray tower casing, the highly advanced HP Pavilion 8600 series is powered by dynamic Intel Pentium III and AMD Athlon processors. Innovative new features include CD-ROM storage at the top of the chassis for up to 8 CDs, CD

reading and writing capabilities (depending on the model), and conveniently located front connections to USB and serial ports. The enhanced HP Pavilion one-touch multimedia keyboard provides instant access to frequently used functions, and the Internet buttons link you directly to your favourite websites via the ISP with whom you can register directly free* of charge or as a subscriber. Easily expandable and upgradeable, these are powerfully attractive PCs at a powerfully attractive price!

* Terms and conditions apply

Model	6617	6621	8637	8632
CPU	Celeron® 566MHz	Celeron® 600MHz	ATH750MHz	PentiumIII 866MHz
Memory	64MB	64MB	128MB	128MB
HDD	10.2GB	15GB	20GB	20.4GB
CD-ROM	48xCD	48xCD	CDR-W	8xDVD & CDRW
Modem	V.90 56Kbps	V.90 56Kbps	V.90 56Kbps	V.90 56Kbps
Op. system	Windows® 98SE	Windows® 98SE	Windows® 98SE	Windows® 98SE
Monitor	15"	17"	15"	17"
Part number	(A1174)	(A2402)	(A2403)	(A1181)
GST Ex + GST	\$1,544 + \$154.40	\$1,817 + \$181.70	\$2,726 + \$272.60	\$4,544 + \$454.40
GST INC	\$1,698.40	\$1,998.70	\$2,998.60	\$4,998.40
Monitor	17"		17"	19"
Part number	(A2413)		(A1179)	(A2404)
GST Ex + GST	\$1,726 + \$172.60		\$2,908 + \$290.80	\$4,817 + \$481.70
GST INC	\$1,898.60		\$3,198.80	\$5,298.70

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HP PROCURVE

HP ProCurve Switch 408

Unmanaged 8 port 10/100 switch in a compact sized package. This switch offers half/full duplex, 10/100 autosensing on every port.
Warranty: Lifetime, Exchange Next Day
GST Ex: \$444 + GST: \$444.40 (79125)
GST INC: **\$488.40**

HP ProCurve 2224 Switch



Low-cost desktop switch ideal for delivering performance to workgroups with a mix of 10Mbps and 100Mbps devices and for migrating from 10Base-T to 100Base-TX:

- 24 10/100Base-TX autosensing ports
- One open transceiver slot
- Unmanaged
- Low, industry-leading price

Rent 3yrs - **\$11.73***
GST Ex: \$973 + GST: \$97.30
(75515) GST INC:

\$1,070.30

HP ProCurve Switch 2424M



Desktop switch ideal for low-cost migration to 10/100 stackable switching:

- 24 10/100Base-TX autosensing ports
- Open module slot for Gigabit stacking and uplinks
- Managed
- Low industry-leading price
- **FREE Top Tools software incl.**

Rent 3 yrs **\$21.48***
GST Ex: \$1,782 + GST: \$178.20
(75513) GST INC:

\$1,960.20

HP ProCurve 4000M Switch



A feature-rich, modular 10/100/Gigabit desktop switch that provides low-cost switching and all the benefits of HP Proactive Networking. Ideal for medium-to-large businesses looking for scalable, expandable, low-cost migration to 10/100/Gigabit switching to the desktop.

FREE Top Tools software incl.
GST Ex: \$3,779 + GST: \$377.90
(66063) GST INC: **\$4,156.90**

Optional Gigabit Module for
GST Ex: \$1,706 + GST: \$170.60
(76563) GST INC: **\$1,876.60**



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All systems include: 7 mass storage shelves (4 available after floppy, CD-ROM & 9GB disc), 5 expansion slots (4 PCI, 1 ISA combination), integrated 10/100 network interface, and easy set up CD.



NETSERVER E-200

The Server with the best price/performance value for small businesses.

Starts your small business off on the right Track. The HP NetServer E200 offers the best value-to-performance ratio of any major server supplier.

A desktop PC may do the job when you are starting out, but as your small business expands, it quickly out grows the ability to cut corners on something as fundamental as a server. And with the HP NetServer E200 HP leads the top tier server suppliers offering full server grade technology, functionality and performance for the price of a PC.

- Intel PIII600 MHz processor with 133MHz front size bus
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- 9.1GB, 7200rpm, 68-pin Ultra Wide SCSI HDD
- Four PCI, one ISA
- Integrated HP NetServer 10/100TX LAN adapter

Rent 3 yrs - **\$25.90***

GST Ex: \$2,402 + GST: \$240.20

(A1489) GST INC: **\$2,642.20**

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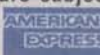
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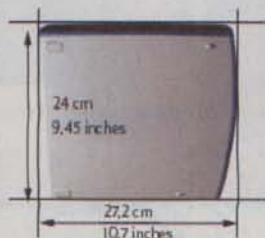
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The revolutionary e-Vectra measures only 9.5 inches (24 cm) high.



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Removable, generously proportioned hard disk drive for all user needs.



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Lockable USB, serial, parallel, PS/2 and LAN ports to fit your computing environment.



Media Choice
Fast, slim CD and media-free models.



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Powerful Intel Pentium III and Celeron processor configurations and generous RAM to suit any business application.



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Choose from a range of Microsoft operating systems including Windows 2000 to match your corporate standard.



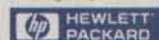
e-Diagnostics
The intelligent eDiagTools technology allows instant problem identification and web-enabled notification to HP or your support staff.

Processor:	HP e-Vectra C566	HP e-Vectra C533	HP e-Vectra P733	HP e-Vectra P733
SDRAM	64MB	128MB	128MB	128MB
Hard Disk	8.4G	8.4G	8.4G	8.4G
FDD	optional	optional	optional	optional
Monitor	no	no	no	no
CD - ROM	24x	24x	24x	24x
OS	Windows '98	Windows '98	Windows '98	Windows 2000
GST Ex	\$1,355	\$2,272	\$2,414	\$2,591
+ GST	+ \$135.50	+ \$227.20	+ \$241.40	+ \$259.10
Part No.:	(A3532)	(98420)	(A3530)	(A3529)
GST INC:	\$1,490^{-50*}	\$2,499^{-20*}	\$2,655^{-40*}	\$2,850^{-10*}
Rental:	\$16.33	\$24.51	\$24.51	\$27.95

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Home Multimedia PC's

Acer Aspire 6400

Bringing the world of multimedia into the home. The Aspire series is your ticket to not just a user-friendly, but also a "family-friendly" learning experience. Uncomplicated and designed to bring families together, the Aspire series is a strong start on the computing journey.

All Aspires come with the following fantastic software:

- Hasbro 3 game CD: Sorry!, Yahtzee, Smart Games Challenge II*
- World Book Multimedia Encyclopaedia
- Aspire time Machine System recovery
- MS Windows 98SE/I.E.5.0
- Microsoft Works 4.5
- Hasbro Interactive Battleship*
- Acer Camera Software Site**
- Aspire webSIGHT**
- Acer Computer Explorer*
- PC-Cillin antivirus
- PC-Doctor
- My Aspire Guide
- Aspire Recovery CD
- KidDesk Internet Safe

* Not included with Aspire 6400
** Included only with Aspire 6400

All Aspires standard with

- 15" Monitor
- Speakers
- v.90 56k internal fax
- microtower housing



Model	Aspire 6400
CPU	Pentium III 667
Memory	64MB
HDD	15GB
CD/LAN	8x4x32 CD-RW
Video	nVidia TNT-2 16MB
Op. system	Win 98
Part number	(A3553)
GST Ex + GST	\$2,272 + \$227.20
GST INC	\$2,499.20



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Pentium III available in some Acer Systems

Acer Power Series

Model	AcerPower Se	AcerPower Sn
CPU	C600	PIII677
Memory	64MB/10G	64MB/10G
CD-LAN	CD-LAN	CD-LAN
Op. system	Win 98	Win 98
BONUS software	Lotus Smartsuite Quicken Business	MS Office SBE
Part number	(A3554)	(A3555)
GST Ex + GST	\$1,635 + \$163.50	\$2,090 + \$209.00
GST INC	\$1798.50	\$2,299.00

- Includes:
- Acer 15" CRT monitor
 - Speakers
 - Integrated UMA 8MB VGA (AcerPower Se)
 - 8MB ATI RagePro TURBO 3D graphics accelerator (AcerPower Sn)
 - 16-bit sound
 - Microtower • PC-Cillin anti-virus

At the heart of the **AcerPower Se** series is the SiS620/5595 AGPset chipset, which provides a platform for the full range of Intel® Celeron processors. The microtower housing design provides total structural integrity, durability and operational peace of mind integrated within an attractive and highly useable housing.

AcerPower Sn: The 16-bit audio on a PCI interface which further enhances multimedia-computing environments and adds rich sound to your multimedia projects. The AcerPower Sn has the winning combination for small businesses.



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Model	520iT	521TXV
Screen	12.1" TFT	14" TFT
CPU	C550	PIII600SpeedStep
Memory	64MB	64MB
HDD	4.8GB	6GB
Graphics	8MB	8MB
CD-ROM	24xCD	NO
DVD	NO	6xDVD
Fax/Modem	56Kbps	56Kbps
LAN Card	10/100 LAN	10/100 LAN
Op. system	Win 98 SE	Win 98 SE
Part number	(A2424)	(A2425)
RENT*	\$31.37	\$44.17
GST Ex + GST	\$2,908 + \$290.80	\$4,297 + \$429.70
GST INC	\$3,198.80	\$4,726.70

Acer 600
Series



Acer 340
Series



Our 2-hour warranty service is our commitment to you.

Everyone at Acer is committed to being there for you like no one else will. That's why six out of ten of Australia's biggest IT users, use Acer PCs. And why Acer was rated No.1 in customer service and support by the Australian Personal Computer magazine survey. Our quality TravelMate notebooks now carry our guarantee of a 2-hour warranty service in Sydney, Melbourne, Brisbane, Canberra, Perth and Adelaide*. This means we'll fix your TravelMate notebook within two hours of you dropping it off at one of our service centres. Acer is the only computer company that can make that assurance to all its customers. Call 1300 366 567 or visit www.acer.com.au.

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Model	345T (CD)	345T (DVD)	508DX	602TER
Screen	12.1" TFT	12.1" TFT	12.1" HPA	13.3" TFT
CPU	PIII600SpeedStep	PIII600SpeedStep	C500	PIII650SpeedStep
RAM	64MB	64MB	32MB	64MB
HDD	6GB	6GB	4.8GB	12GB
Graphics	2.5MB	2.5MB	2MB	8MB
CD-ROM	24 x CD	NO	24 x CD	20x4x4 CD-RW
DVD	NO	6 x DVD	NO	NO
Fax/Modem	56Kbps	56Kbps	56Kbps	56Kbps
Other	10/100 Lan	10/100 Lan	NO	10/100 Lan
OS	Win 98 SE	Win 98 SE	Win 98 SE	Win 98 SE
Part	(94817)	(94818)	(A3290)	(A2426)
RENT*	\$41.58	\$43.91	\$23.50	\$53.69
GST EX + GST	\$4,045+ \$404.50	\$4,272+ \$427.20	\$2,179 + \$217.90	\$5,355 + \$535.50
GST Inc	\$4,449.50	\$4,699.20	\$2,396.90	\$5,890.80

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ThinkPad A20M

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- 64MB RAM standard
- HDD 6GB
- 24 x CD-ROM
- 12.1" TFT screen
- Windows 98



Rent 3 years - **\$34.11****

GST Ex \$3,162 + GST \$316.20 (A0693) GST INC

\$3,478.20

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ThinkPad T20

- Pentium III 700SSMHz
- 128MB RAM standard
- HDD 12GB
- 6 x DVD
- 14.1" TFT screen
- Windows 2000



Rent 3 years - **\$68.53****

GST Ex \$7,181 + GST \$718.10 (A0702) GST INC

\$7,899.10

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Experience the flexible, easy-to-use, ultracompact design of the IBM NetVista legacy-free system. You can count on fast, easy connections, reduced need for support and lower costs with today's current technologies, including USB.

NetVista S40 LEGACY-FREE

Processor	PIII667MHz	PIII733MHz
RAM	128MB	128MB
HDD	10GB	20GB
CD-ROM	40X CDROM	40X CDROM
LAN	10/100 NIC	10/100 NIC
Op System	Windows 2000	Windows 2000
Rent TAP*	\$21.90**	\$22.74**
Part No	(A1299)	(A1300)
GST Ex	\$1,817	\$2,108
+GST	\$181.70	\$210.80
=GST INC	\$2,998.70*	\$2318.80*



* Monitor not included

** Inc GST per week over 3 years

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It's smarter business to rent

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Netfinity 3500 Server

Netfinity 3500

- Pentium III 733MHz
- 128MB RAM standard
- 9.1Gb HDD, Maximum storage capacity 145.6GB
- 256KB Level 2 Cache
- CD-ROM 48x max, 17x min
- Network Interface: Ethernet- Integrated

Rent 3 yrs - **\$45.20****

GST Ex \$4,397 + GST \$439.70

(A3354) GST INC **\$4,836.70**

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iPaq- Computing for the Internet Age!

**NO MONITOR	iPaq Legacy
Processor	Pentium III 500
RAM	128Mb
Hard Disk	8.4Gb
Op System	Win 95/98
Part #	(A2060)**
Rent 3 Yrs*	\$16.38
GST Ex + GST:	\$1,359 + \$135.90
GST Inc	\$1,494.⁹⁰
Op System	Win NT 4.0
Part #	(A2341)**
Rent 3 Yrs*	\$17.96
GST Ex + GST:	\$1,490 + \$149.00
GST Inc	\$1,639.⁰⁰
Op System	Win 2000
Part #	(A2342)**
Rent 3 Yrs*	\$17.96
GST Ex + GST:	\$1,490 + \$149.70
GST Inc	\$1,639.⁰⁰

This uniquely designed product is ideal for networked environments & for mainstream office productivity applications & corporate Internet/Intranet access.



iPAQ
desktop

Presario 1700 Notebook Series



The Presario 1700 with FutureBay has been designed with the aim to offer users the ability to customise their notebook to meet their individual needs.

#SPEED STEP	1700XL	1700XL
Processor	PIII 650MHz SS#	PIII 600MHz SS#
RAM	64MB	64MB
Hard Disk	12.0 GB	6.0GB
Screen	14.1" TFT	13.3" HPA
CD-ROM	no	24xCD
DVD	6x DVD	no
Modem	56K	56K
Op System	Win 98SE	Win 98SE
Part N°	(A3414)	(A3412)
Rent 3 Yrs*	\$46.75	\$41.34
GST Ex + GST:	\$4,663 + \$466.30	\$4,022 + \$402.20
Inc Tax	\$5,129.³⁰	\$4,424.²⁰

**Multibay
CD-Option
for iPaq**
GST Ex
\$173 + GST
\$17.30
GST Inc
\$190.30
(A2348)

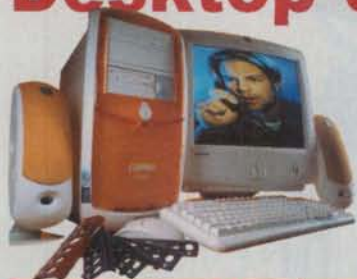
Compaq Monitors

15" S510
Monitor
GST Ex
\$340 + GST
\$34.00
GST Inc
\$374.00
(A0067)

17" S710
Monitor
GST Ex
\$509 + GST
\$50.90
GST Inc
\$559.90
(97852)

19" S910
Monitor
GST Ex
\$845 + GST
\$84.50
GST Inc
\$929.50
(93804)

Presario 5000 Desktop Series



The Presario 5000 Series delivers solid features without compromising quality or performance.

**NO MONITOR	5110	5140	5180
Processor	PIII 566MHz	PIII 650MHz	PIII 750MHz
RAM	64MB	128MB	64MB
Hard Disk	10.0GB	15.0GB	20.0GB
CD-ROM	40x	40x CD-ROM2	CDR-W
DVD	no	no	no
Modem	56K	56K	56K
Op System	Win 98SE	Win 98SE	Win 98SE
Part N°	(A3405)**	(A3406)**	(A3407)**
Rent 3 Yrs*	\$18.62	\$21.95	\$27.15
GST Ex + GST:	\$1,545 + \$154.50	\$2,036 + \$203.50	\$2,517 + \$251.70
Inc Tax	\$1,699.⁵⁰	\$2,238.⁵⁰	\$2,768.⁷⁰

Presario 7000 Desktop Series

The Presario 7000 Series offers the customer "Smart Solutions. Powerful Performance!"



**NO MONITOR	7000	7000
Processor	PIII 800MHz	PIII 933MHz
RAM	128MB	128MB
Hard Disk	30.0GB	30.0GB
CD-ROM	CDR-W	CDR-W2
DVD	8x DVD	8x DVD
Modem	56K	56K
Op System	Win 98SE	Win 98SE
Part N°	(A3333)**	(A3408)**
Rent 3 Yrs*	\$37.26	\$43.46
GST Ex + GST:	\$3,454 + \$345.40	\$4,228 + \$422.80
Inc Tax	\$3,799.⁴⁰	\$4,650.⁸⁰

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Sony VAIO F660

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GST Ex \$4,363 + GST \$436.30

(A2497) GST INC **\$4,799.³⁰**



Sony VAIO Z505FA

- Mobile Intel Pentium III Processor 650MHz featuring Intel SpeedStep Technology • 128MB SDRAM memory • 12GB hard drive • 12.1" XGA colour TFT colour display • Memory Stick Direct Slot • Direct Ethernet port

GST Ex \$5,090 + GST \$509.00

(A2498) GST INC **\$5,599.⁰⁰**



Sony VAIO XE7

- Mobile Intel Pentium III Processor 650MHz featuring Intel SpeedStep Technology • 128MB SDRAM memory • 18.1GB hard drive • 14.1" XGA colour TFT display • Removable CD-RW drive • Mini docking station

GST Ex \$6,181 + GST \$618.10

(A2496) GST INC **\$6,799.¹⁰**



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Cyber-shot

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Memory Stick Digital Camera 1.3 Megapixel resolution (1.6 megapixel interpolated) 6x Precision Digital zoom (3x Optical zoom) 2" Colour LCD monitor, Interlace Scan Super HAD CCD InfoLITHIUM M series battery 12bit A/D conversion Super Resolution Converter Automatic Focus Automatic/Priority Aperture Automatic/Priority Shutter Auto/Manual/Preset White Balance Exposure control



GST Ex \$973 + GST \$97.30
(99849) GST INC

\$1,070.³⁰

MSAC-US1 Memory Stick USB Adapter

- USB Interface Windows 98 compatible
- Macintosh compatible (MacOS 8.5.1 or newer)
- Operating Voltage: 4.75 - 5.25V (bus powered)
- Dimensions (WxHxD): 68x89x25mm • Weight: 70g



GST Ex \$141 + GST \$14.10

(97398) GST INC **\$155.¹⁰**

Sony CyberShot DSC-S70

Memory Stick Digital Camera 3.3 Megapixel resolution, 6x Precision Digital zoom (3x Optical zoom), 2" Colour LCD monitor, Super HAD CCD InfoLITHIUM M series battery, MPEG Movie function, Auto Focus, Auto/Priority Aperture, Auto/Priority Shutter, Sharpness control Spot Metering Automatic Photo Orientation (Portrait/Landscape) Built-in flash, red-eye reduction, External Flash socket, On-Screen Display, video/audio out, USB In/Out, Self Timer function Date/Time Stamp function Windows and Mac compatible



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(99850) GST INC

\$1,819.⁴⁰

Assorted Memory Sticks

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GST Ex \$38 + GST \$3.80 (88647) GST INC **\$41.⁸⁰**

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GST Ex \$95 + GST \$9.50 (86779) GST INC **\$104.⁵⁰**

32MB Memory Stick

GST Ex \$145 + GST \$14.50 (88654) GST INC **\$159.⁵⁰**

64MB Memory Stick

GST Ex \$252 + GST \$25.20 (88648) GST INC **\$277.²⁰**

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LL-T155A



- Screen size 15-inch (diagonal 38cm), resolution XGA (max 1024 x 768 dots)
- High-Resolution (200 cd/m², 300:1) TFT LCD for superb image quality, up to 16 million colours
- Auto balance (automatic colour level adjustment)
- Automatic pixel converter (VGA/SVGA)
- Long-lasting backlights- up to 50,000 hours
- Power management function- max 22W during operation, down to 5W during power safe mode
- Plug and play compatible- Win 95/98
- USB for easy connection to various peripheral devices
- Uses one-fourth the space of a CRT monitor
- User-friendly design with reduced flicker is easier on the eyes.

GST Ex \$1,936 + GST \$193.60 (A2819) GST INC

\$2,129.60

PCA820



- Intel Pentium III 500MHz Processor
- 8.1Gb Hard Disk Drive
- 64Mb RAM (Expandable to 192Mb)
- 24x CD-Rom drive
- 13.3" Low-reflection XGA TFT LCD Screen
- Display resolution 1024 x 768 up to 16 Million Colours
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- Includes 56K fax modem built-in
- NeoMagic NM2380 (including 6.0MB Video RAM)
- Type II slot x 1, cardbus support
- Li-ion Battery pack (1.8 hours)

GST Ex \$4,817 + GST \$481.70 (A1533) GST INC

\$5,298.70

FO2950M

Advanced performance with convenient email functions



- Fast 14.4 Kbps modem, 6 sec/page transmission speed
- 8 ppm quick scan
- 8 ppm print speed
- Capacity: 200 sheets and a 20 sheet auto document feeder.
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- Automatically forward incoming faxes to a designated e-mail address.

GST Ex \$1,173 + GST \$117.30 (A2549) GST INC

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- High Quality 600dpi Digital Laser Multifunction (copy, print, fax, scan)
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- Easy operation from Fax Operation Panel
- Built in Scanner function, twain compliant
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- Zoom function with Reduction/Enlargement from 50% to 200%
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GST Ex \$1,063 + GST \$106.30
(A2358) GST Inc

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* Monitor Not Included

This system with 15" Compucon Multimedia Monitor:

Rent 3 Yrs** **\$16.39** GST Ex \$1,360 + GST

\$136.00 GST Inc: **\$1,496.00**

Monitor price is

GST Ex \$284 + GST \$28.40

(25874) GST Inc **\$312.40**

Intel Celeron



566MHz

Intel Celeron Processor

- PS/2 Wheel Mouse
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- 10.2GB Hard Disk Drive
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- 2 Serial, 1 Parallel & 2 USB Ports
- PS/2 104-key Keyboard
- 10MB Combo Network Card

- Midi-Tower Case
- 1.44 Floppy Disk Drive
- 3 Years On-Site Warranty

Rent 3 Yrs** **\$14.02**
GST Ex \$1,162 + GST \$116.20
(A2359) GST Inc

\$1,278.20*

* Monitor Not Included

This system with 15" Compucon Multimedia Monitor:

Rent 3 Yrs** **\$17.44** GST Ex \$1,447 + GST

\$144.70 GST Inc: **\$1,590.70**

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Intel Pentium III



667MHz

Intel Pentium III Processor

- 10.2GB Hard Disk Drive
- 32MB SDRAM
- 4MB AGP Graphics Card (ATI Range)
- 1x AGP, 4x PCI and 3x ISA Slots
- 2 Serial, 1 Parallel & 2 USB Ports
- PS/2 Wheel Mouse
- Windows 95
- PS/2 104-key Keyboard
- 10MB Combo Network Card

- Midi-Tower Case
- 1.44 Floppy Disk Drive
- 3 Years On-Site Warranty

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GST Ex \$1,432 + GST \$143.20
(A2361) GST Inc

\$1,575.20*

* Monitor Not Included

This system with 17" Compucon Multimedia Monitor:

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(25906) GST Inc **\$442.20**



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1

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2

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3

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5

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GST Ex: \$319 + GST: \$31.90

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2

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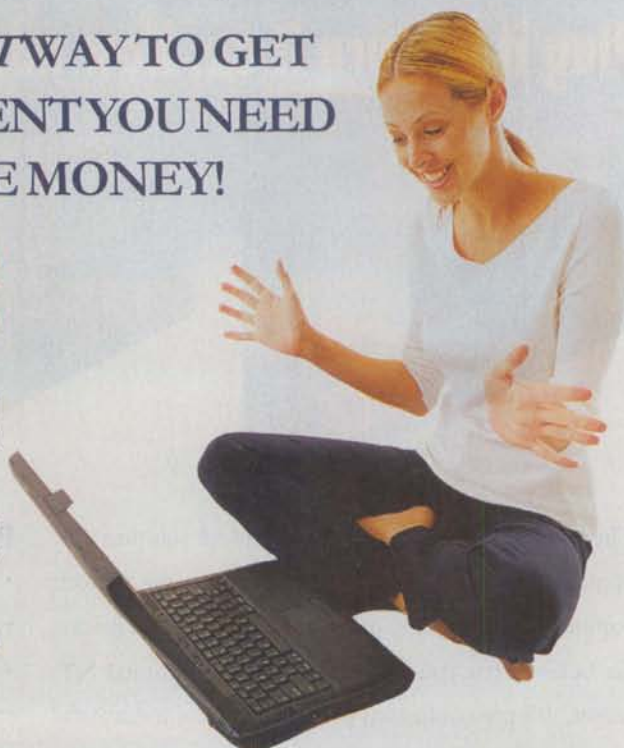
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8 Port Autosensing

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1500
BONUS POINTS

GST Ex: \$252 + GST: \$25.20
(70905) GST Inc: **\$277.20**

FS 308

8 Port Autosensing

FLY BUYS
1500
BONUS POINTS

GST Ex: \$436 + GST: \$43.60
(77242) GST Inc: **\$479.60**



FS 516

16 Port Autosensing

FLY BUYS
1500
BONUS POINTS

GST Ex: \$850 + GST: \$85.00
(60522) GST Inc: **\$935.00**

FS 524

24 Port Autosensing

FLY BUYS
1500
BONUS POINTS

GST Ex: \$1008 + GST: \$100.80
(77549) GST Inc: **\$1,108.80**

Collect
1,500 Bonus
Fly Buys
points
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84722,
70905,
77242,
60522 or
77549
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20/8/00 &
30/9/00

TAKE THE WORK OUT OF NETWORKING NETWORK STARTER KITS



Free
modem sharing
software

The NETGEAR Network Starter kits give Windows users everything they need to start networking right away at either 10 Mbps or 100 Mbps. The kits containing 10/100 PCI cards, a hub or switch, network cables, modem sharing software and an easy to read how to guide. Within a few minutes, you will be able to share files and printers, exchange e-mails, play interactive games and share access to the Internet.

DB 104

4 Port Dual speed starter kit

GST Ex: \$201 + GST: \$20.10
(77292) GST Inc: **\$221.10**

FB 105

5 Port switch starter kit

GST Ex: \$315 + GST: \$31.50
(73997) GST Inc: **\$346.50**

SB 105

5 Port 10 Mbs starter kit

GST Ex: \$119 + GST: \$11.90
(A3293) GST Inc: **\$130.90**

Netgear offers FREE 24-hour phone support



10/100 DUAL SPEED HUBS

These Netgear hubs connect multiple PCs to share printers, files, Internet access and e-mail communications. Mix & match 10 and 100Mbps PCs, servers and peripherals on the same network with ease and without the high cost and complexity of multiple hubs and bridges. All feature easy, plug and play installation, auto-sensing dual speed ports and vista network ports with built-in LEDs.



DS 104

4 Port Slim Line

GST Ex: \$145 + GST: \$14.50
(70795) GST Inc: **\$159.50**

DS 309

GST Ex: \$337 + GST: \$33.70
(87479) GST Inc: **\$370.70**

DS 106

6 Port Slim Line

GST Ex: \$198 + GST: \$19.80
(84721) GST Inc: **\$217.80**

DS 508

8 Port Stackable

GST Ex: \$423 + GST: \$42.30
(18738) GST Inc: **\$465.30**

DS 108

8 Port Slim Line

GST Ex: \$205 + GST: \$20.50
(18755) GST Inc: **\$225.50**

DS 516

16 Port Stackable

GST Ex: \$597 + GST: \$59.70
(18747) GST Inc: **\$656.70**

DS 116

16 Port Slim Line

GST Ex: \$344 + GST: \$34.40
(81519) GST Inc: **\$378.40**

DS 524

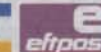
24 Port Stackable

GST Ex: \$699 + GST: \$69.90
(69474) GST Inc: **\$768.90**

SEP
22

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Pricing** and specifications herein are subject to change without notice.



Finance methods
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Cost-effective Connectivity Solutions

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GIGABIT SWITCHES

These 3 new gigabit switches from Netgear make it possible for small businesses and branch offices to fulfill requirements for higher bandwidth as their networks become increasingly congested. The switches provide customers a faster server connection and allow multiple Fast Ethernet users to access the server at 100 Mbps at the same time.

FS 510T

GST Ex: \$1607 + GST: \$160.70
(A1209) GST Inc: **\$1,767.70**

Eight switched 10/100Mbps ports + two 1000Mbps port
(Category 5)

FS 518T

GST Ex: \$2606 + GST: \$260.60
(A1374) GST Inc: **\$2,866.60**

Sixteen switched 10/100Mbps ports + two 1000Mbps ports
(Category 5)

GS 504T

GST Ex: \$2,964 + GST: \$296.40
(A1375) GST Inc: **\$3,260.40**

Four full-duplex Gigabit Category 5 ports

Please Note that Fibre Gigabit Switches are also available

GIGABIT NETWORK CARD



GA 620T

GST Ex: \$631 + GST: \$63.10
(A1382) GST Inc: **\$694.10**

Gigabit Network Interface Card

CABLE/DSL INTERNET GATEWAY



Connect multiple PCs to share single IP address. The NETGEAR RT311 provides NAT service that allows up to 32 users on your 10/100 network to share the high-speed Internet connection. At the same time it also provides firewall protection to guard your network against hackers and unauthorised access from the Internet.

RT 311

GST Ex: \$339 + GST: \$33.90
(97719) GST Inc: **\$372.90**

ISDN ROUTER

Home office Internet access in a box. Includes built-in ISDN TA, 128 MultiLink PPP, DHCP Server, Dynamic NAT+, Dial-on-Demand Routing. Provides Internet access, LAN-to-LAN intranet connection, and remote access for a single user, a small business, or a branch office over ISDN.

RT 328

GST Ex: \$525 + GST: \$52.50
(68900) GST Inc: **\$577.50**

ISDN ROUTER



Latest technology with ease-of-use designs. Compatible with all major Internet ISDN equipment, this is the ideal router for Internet access, LAN-to-LAN connection, and remote access for a single user, small business or branch office over ISDN. Includes auto sensing input 10/100 network port & caller ID on phone ports.

RT 338

GST Ex: \$568 + GST: \$56.80
(97718) GST Inc: **\$624.80**

ANALOG MODEM ROUTER

Connect multiple PCs to the Internet

Router + integrated 56K modem + integrated 4-port 10BaseT hub
• DHCP server • Dynamic NAT+ • Dial-on-Demand-routing • Hi/fn (STAC LZS) compression • 5 year warranty •



RM 356

GST Ex: \$494 + GST: \$49.40
(70197) GST Inc: **\$543.40**

PRINTER SERVERS



The NETGEAR print servers let you share any parallel printer among all users on the network without having to dedicate a PC for print serving and without complex setup and configuration. These print servers connect directly to the network and can be placed anywhere convenient to the users. With a built-in network 4 port hub, the PS105 is an all-in-one connectivity solution for the SOHO users- providing file, print and resource sharing as well as network gaming.

PS 105

GST Ex: \$188 + GST: \$18.80
(67225) GST Inc: **\$206.80**

10MbpsPrint Server

The PS110 attaches to a 10 or 100Mbps hub or switch, providing effortless transition from Ethernet to Fast Ethernet. It also supports 2 parallel printers.

PS 110

GST Ex: \$211 + GST: \$21.10
(67226) GST Inc: **\$232.10**

10/100Mbps Print Server

PS 113

GST Ex: \$Call + GST: \$Call
(A3287) GST Inc: **\$Call**

10/100Mbps print server supports up to 3 parallel printers

10MBPS ETHERNET HUBS



Vista jacks with built-in LED indicators • Uplink port for network expansion • Slim, sturdy metal case design • BNC/AUI backbone support option • Limited lifetime warranty • Easy plug and play installation

EN 104TP

GST Ex: \$60 + GST: \$6.00
(53456) GST Inc: **\$66.00**

4 Port Slim Line

EN 108TP

GST Ex: \$88 + GST: \$8.80
(53458) GST Inc: **\$96.80**

8 Port Slim Line

EN 116

GST Ex: \$196 + GST: \$19.60
(53459) GST Inc: **\$215.60**

16 Port Slim Line

EN 516

GST Ex: \$207 + GST: \$20.70
(17425) GST Inc: **\$227.70**

16 Port Rackmount

EN 524

GST Ex: \$271 + GST: \$27.10
(17435) GST Inc: **\$298.10**

24 Port Rackmount



• 16 or 24 10BASE-T ports • Easy installation • Vista network port with built-in LEDs • BNC/AUI backbone support • Internal power supply

NETGEAR

FA 310

Ethernet Adapter 10/100 PCI



(53460)
GST Ex: \$43
GST: \$4.30
GST Inc: **\$47.30**

FA 312

Wake on Lan card (A1373)
GST Ex: \$52
GST: \$5.20
GST Inc: **\$57.20**

FA 410

PCMCIA 10/100 Mbps Network Card



(60071)
GST Ex: \$140
GST: \$14.00
GST Inc: **\$154.00**

FA 510

Network Card for Notebook PC (81319)
GST Ex: \$145
GST: \$14.50
GST Inc: **\$159.50**

Small-Medium Business Networks

DES-3624IF 24 Port Stackable Giga Switch



The DES-3624IF unit offers 24 ports of 10/100TX. Plus 1 100 base FX (SC) port build in SNMP and RMON agents. Optional giga module available.

**NEW
PRODUCT**

GST Ex: \$1,816 + GST: \$181.60
(90759) GST Inc: **\$1,997.60**

DES-1016R 16 Port Switch for Workgroups



Built with advanced functions, these switches are designed for the workgroups with advanced requirements. Powerful yet easy to use, they allow users to simply plug any port to either a 10Mbps or 100Mbps node to multiply bandwidth, boost response time and satisfy heavy load demand. Rack mountable.

GST Ex: \$999 + GST: \$99.90
(69456) GST Inc: **\$1,098.90**

DES-1024R 24 Port Switch for Workgroups



24 port Auto negotiating 10/100Mbit Switch (NWay). Supports UTP/STP cables. MDI-II Uplink ports Support Full/Half duplex. Provides cut-through and fast store & forward switching. Rack mountable.

GST Ex: \$1356 + GST: \$135.60
(76740) GST Inc: **\$1,491.60**

DES-1008D 8 Port Fast Ethernet Switch



The D-Link DES-1008D is a powerful desktop Dual Speed 8-port 10/100Mb Ethernet/Fast Ethernet NWay auto-negotiating Switch.

GST Ex: \$282 + GST: \$28.20
(98254) GST Inc: **\$310.20**

DI-701 Cable ADSL Gateway

The D-Link DI-701 Residential Gateway protects your computers from hackers or unwanted users. It is the easiest and safest way to share your high-speed Internet connection with a DSL Modem or Cable Modem.



**NEW
PRODUCT**

GST Ex: \$368 + GST: \$36.80
(98249) GST Inc: **\$404.80**

DP-601M Internet Ready Server with Built-In Modem

1 x 10/100Mbps NWay Ethernet Port, 1 x V.90/K56flex modem port. Supports NAT for single ISP user account, Dial-on-Demand, DHCP, PPP, PAP/CHAP Security.



GST Ex: \$354 + GST: \$35.40
(85107) GST Inc: **\$389.40**

Other products available from D-Link

Description	Part #	Gst Ex	+ GST	GST Inc
D-Link DP-300 10/100 Print Server (1xSer,2xPar)	53598	\$267	\$26.70	\$293.70
D-Link DU-560M External V.90 56K Voice/Fax/Data Modem (USB)	98306	\$108	\$10.80	\$118.80
D-Link DFM-560I Internal PCI V.90 56K Voice/Fax/Data Modem	74361	\$66	\$6.60	\$72.60
D-Link DES-3225G 22+2 port 10/100Mbps Mang Switch W/ V-Lan	90755	\$1,872	\$182.70	\$2,009.70
D-Link DFE908DX 8 Port 10/100Mbps Dual Speed Hub	60558	\$261	\$26.10	\$287.10
D-Link DFE-916DX 16 Port 10/100Mbps Dual speed hub	87207	\$508	\$50.80	\$558.80
D-Link DFE2624x24-port 10/100Mbps Stackable Dual Speed Hub	98307	\$1064	\$106.40	\$1,170.40
D-Link DP-602 2 Port Internet Network Server	81535	\$338	\$33.80	\$371.80
D-Link DFE-530TX PCI-Bus 10/100Base TX Fast Ethernet Adapter	62956	\$34	\$3.40	\$37.40



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Connectivity where & when you need it

3Com® Megahertz® 10/100 LAN+56K Global Modem CardBus PC Card

The 3Com® Megahertz® 10/100 LAN+56K* Global Modem CardBus PC Card delivers high-speed LAN and modem connections the world over. A 32-bit CardBus architecture ensures true 100 Mbps LAN performance and the V.90 56K standard delivers high-speed modem downloads.

Plus, its durable autosensing XJACK® connector eliminates the need to carry any cables.



3Com Megahertz 10/100 LAN + 56K Global Modem with XJack GST Ex \$396 + GST \$39.60

(99215) GST Inc **\$435.⁶⁰**

3Com® Megahertz® 10/100 LAN CardBus PC Card with XJACK®

Get desktop manageability in a PC Card with the 3Com® Megahertz® 10/100 LAN. CardBus PC Card.

XJACK® connector delivers durable connections without carrying or losing cables. And this PC Card provides true 100 Mbps Fast Ethernet performance in 32-bit CardBus notebooks. It features

low power consumption, guaranteed compatibility, and DynamicAccess® technology.



3Com Megahertz 10/100 Cardbus PC Card XJACK GST Ex \$275 + GST \$27.50

(74695) GST Inc **\$302.⁵⁰**

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Broadway (Sydney)
Burwood (Melbourne)

Kmart Shoppers!

Not all products are in-store, but consulting & advice available on all items

3Com® OfficeConnect™ Dual 56K Modem



OfficeConnect Dual 56K LAN Modem brings low-cost, high-speed Internet and Ethernet connectivity to your Small Office/Home Office computers in just minutes! This product is designed for non-technical users that need radical simplicity, high speed Internet access as well as local file and print sharing capability.

GST Ex \$668 + GST \$66.80

(A3358) GST Inc **\$734.⁸⁰**

3Com® AirConnect™ 11 Mbps Wireless LAN Solution



AirConnect 11Mbps Wireless LAN PC Cards and Access Points deliver **simple, reliable and manageable wireless connections** at Ethernet speeds. Dynamic rate shifting and load balancing optimize connectivity, while access control features provide security. AirConnect simplifies network setup with its PowerBASE-T feature and Site Survey Utility. Once installed, the SNMP management facility and Web-based tools ensure easy network management and configuration.

3Com AirConnect™ Wireless Access Point

GST Ex \$1,764 + GST \$176.40

(A1869) GST Inc **\$1,940.⁴⁰**

3Com AirConnect Wireless LAN Starter Pack

GST Ex \$2,630 + GST \$263.00

(A1867) GST Inc **\$2,893.⁰⁰**

3Com AirConnect™ 11Mbps Wireless LAN PC

Card GST Ex \$322 + GST \$32.20

(A1868) GST Inc **\$354.²⁰**

* Capable of receiving downloads at up to 56 Kbps and sending at up to 31.2 Kbps. Due to IC/FCC regulations on power output, receiving speeds are limited to 53 Kbps. Actual speeds may vary. Requires compatible analog phone line and server equipment. See www.3com.com/ 56k/ for details.

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Fax: 1300 13 6666

Website: www.ht.com.au
E-mail: sales@ht.com.au

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SEP
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Makes Networking Easy

Intel® InBusiness™ 4-port and 8-port Fast Hubs

Simple Fast Ethernet Connectivity for small Business networks

Intel® InBusiness™ are designed for speedy transfer of large files, database access, multimedia applications, and any other activities that require faster network performance. A crossover port enables multiple hubs to be connected for network expansion.



Intel®
InBusiness™
10/100
Switches
Simple,
increased
network
performance
for standard
Fast Ethernet



- Easily Connects devices to create Fast Ethernet networks
- Crossover port for expandability
- Autosensing 10/100 ports, requiring no configurations
- Covered by a limited lifetime warranty

8 Port Fast Hub

GST Ex \$232 + GST \$23.20

(57827) GST Inc **\$255.²⁰**

4 Port Fast Hub

GST Ex \$161 + GST \$16.10

(58546) GST Inc **\$177.¹⁰**

Intel® pro/100+ Management Adapters

Fast, manageable 10/100 network connections

Driver Compatibility - Intel compatible network drivers lower cost of maintenance.

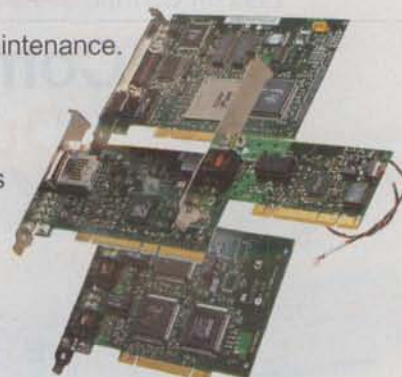
Drivers configure quickly and easily with Intel® PROSet utility

Built-in advanced management capabilities

- Wake on LAN for remote system wake-up and troubleshooting
- PRO/100+ Boot agent for remote PC deployment and upgrades
- ACPI compliant for flexible power management
- Desktop Management Interface (DMI) 2.0 for remote asset management
- Tivoli agent and Intel LANDesk® Client Manager included for easy management access

Leading performance

- Intel's Adaptive Technology increases network response time while keeping CPU utilization low
- Intel Priority Packet improves bandwidth control
- 10/100 autosensing full-duplex



PRO/100+ Management Adapter

GST Ex \$152 + GST \$15.20

(75328) GST Inc **\$167.²⁰**

Intel® InBusiness™ Print Station

The Ideal Solution for small businesses needing to easily share resources and increase productivity

The Intel InBusiness Print Station is the easy way to share printers over a network. Setup is so simple that within minutes your small-business customers can be printing to shared printers over 10Mbps or 100Mbps network. The Intel InBusiness Print station is part of a complete line of networking products designed specifically for Small Business.

- Connects printers to the network independent of PC's
- Supports two printers with single 10BASE-T or 100BASE-TX connection.
- Increase productivity by conveniently locating printers
- Simple installation wizard
- Offers a complete solutions



GST Ex \$288 + GST \$28.80

(93464) GST Inc **\$316.⁸⁰**



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SEP
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Worldwide Leader in Networking for the Internet

Cisco 800 Series

The Cisco 800 series router provides enhanced network security and reliability through the power of Cisco IOS software tailored for small offices and telecommuters. It is recommended for small offices of up to 20 users, connecting every user to the Internet or to the corporate LAN with one ISDN line.

NB- all software sold separately.



Cisco 801

1 Ethernet and 1 ISDN Basic Rate Interface (BRI)

GST Ex \$1,263 + GST \$126.30 (78662)

GST INC **\$1,389.³⁰**



Cisco 803

4 - port shared Ethernet hub, 2 analog POTS, & 1 ISDN BRI

GST Ex \$1,419 + GST \$141.90 (72566)

GST INC **\$1,560.⁹⁰**

Cisco 805

Frame Relay, leased line, or async dial-up access to the Internet

GST Ex \$1,575 + GST \$157.50 (80398)

GST INC

\$1,732.⁵⁰

Cisco 1600 Series

The Cisco 1600 is the proven choice for the flexible Internet / Intranet access for small branch offices and small businesses. In addition to one fixed WAN port and one Ethernet port, the Cisco 1600 models support one WAN interface card, which allows customers to add or change WAN ports as needed. WAN options include ISDN, Frame Relay and X.25.

NB- all software sold separately.



Cisco 1601 - R

One serial port with synchronous performance up to E1 speeds for Frame Relay and X.25 WAN services, or async performance up to 115.2 kbps. Higher speed than ISDN.

GST Ex \$2,440 + GST \$244.00 (79373) GST INC **\$2,684.⁰⁰**

Cisco 1603 - R

ISDN (BRI) and ISDN leased line connectivity

GST Ex \$2,440 + GST \$244.00 (A0132) GST INC **\$2,684.⁰⁰**

Cisco 1720 Series

The Cisco 1720 access router delivers a flexible, integrated solution for small / medium businesses and small branch offices that want to deploy secure Internet, Intranet, and Extranet access. The Cisco 1720 is a fully modular solution that provides the access router, optional high-speed encryption, a VPN tunnel server, IPSec, and a dynamic firewall. This solution enables you to minimize your setup costs and reduce the ongoing time and expense required to manage the network.

NB- all software sold separately.



Cisco 1720- An integrated routing solution that delivers optimised security and flexibility in a desktop form factor for small / medium businesses or small branch offices interested in deploying Internet, Intranet and Extranet access. Modular WAN slots to support future growth by providing upgradeable WAN services and higher densities of WAN connections. Features and performances to support new world services including VPN's and broadband technologies. Support for encrypted WAN performances greater than 128kbps. Router configurations that require two ISDN BRI interfaces. An autosensing 10/100 Mbps Fast Ethernet LAN connection to provide easy upgrade to Fast Ethernet.

GST Ex \$1,958 + GST \$195.80 (71554) GST INC **\$2,153.⁸⁰**

Cisco Catalyst 2900 Series XL

Cisco's Catalyst 2900 Series XL is a full line of stand alone, 10 /100 autosensing Fast Ethernet switches that combine outstanding performance, ease of use, and integrated Cisco IOS software.



Catalyst 2912XL

Switch for connecting smaller Ethernet Fast Ethernet workgroups or servers
Low entry price

GST Ex \$1,555 + GST \$155.50 (74277) GST INC **\$1,710.⁵⁰**

Catalyst 2924C XL

Dedicated 10 - Mbps or 100 - Mbps connections to individual PC's, servers, and other systems. High-speed uplink flexibility over extended distances with 100BaseFX connections (Catalyst 2924C XL only)

GST Ex \$3,669 + GST \$366.90 (78298) GST INC **\$4,035.⁹⁰**

- Prices include tax - Software needs to be purchased separately - Prices are subject to change without notification

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Modems and Multimedia

Full Product Info:
www.dynalink.com.au

Dynalink Internal 56k V.90 Modems

ISA: All the features of the External. Manually Configurable Jumper Settings. 5-Year Warranty. GST Ex \$108 + GST \$10.80 (77577) GST INC **\$118.80**

PCI: PnP, Send & Receive Faxes, Phone Answer Machine. GST Ex \$67 + GST \$6.70 (72909) GST INC **\$73.70**

PC-Card

• PCMCIA V.90 56k Modem
• Send & Receive Faxes
• 5-Year Warranty
GST Ex \$123 + GST \$12.30 (A2831) GST INC **\$135.30**

Dynalink 56K Voice/Fax/Data Speakerphone Modem

"Good value for money... ease of setup and use is excellent... consistently connects at high speeds." PC World Nov 99. • V.90 / K56flex dual-mode for high Internet compatibility • Plug & play, plus friendly QuickGuide for easy installation • Send and receive faxes from your PC • Supports FaxStream DUET, Caller ID, Speakerphone Mode & VoiceMail.



5 Year Warranty

GST Ex \$123 + GST \$12.30 (54361) GST INC **\$135.30**

Dynalink USB Pocket Modem

• Super-easy Installation.
• Free-up Slots and IRQs.
• No power supply, no messy cables.
• Dual-mode V.90, fax machine, answer machine.
• Pocket sized for convenience and style!

5-Year Warranty

GST Ex \$126 + GST \$12.60 (A2298) GST INC **\$138.60**



NEW! Dynalink USB WebCam

- Turn your PC into a home video workstation.
- Affordable & simple video conferencing.
- Capture video and digital snapshots.
- E-mail video clips.
- Home security capabilities.
- Video software VP-EYE suite included.
- USB simplicity.



GST Ex \$89 + GST \$8.90 (A2832) GST INC **\$97.90**

MagicXpress TView Video Capture Card

"One of the two best cards in terms of picture quality" APC, July 9. Watch TV on your PC & capture incoming video (e.g. from CamCorder). Fully featured, including Teletext & remote control. Resizable window, right up to full-screen (640x480).



Standard:
GST Ex \$113 + GST \$11.30 (72860) GST INC **\$124.30**
With FM Tuner:
GST Ex \$147 + GST \$14.70 (78482) GST INC **\$161.70**

*Six months of free Internet hours with TPG is available in: Sydney, Penrith, Gosford, Kiama/Wollongong, Lake Macquarie, Newcastle, Melbourne, Brisbane, Southport, Gold Coast, Canberra, Adelaide, Perth, Hobart, Launceston and Darwin.
**one-off \$43.95 admin fee, 300MB Download limit per month. Unlimited 3 hour connections. Offer available for a limited time.

Purchase any Dynalink modem & enjoy

6 MONTHS FREE INTERNET

Verbatim Storage for life

Web Direct

www.ht.com.au/cat/verbatim

Full Product Info:
www.verbatim.com.au

Verbatim Signature III Colour CD Printer



The Signature III Colour CD Printer is a new, third generation ink-jet CD Colour printer from industry leader Primera Technology. It combines the fastest print speed ever offered with the highest print resolution available in the world today: 1200x1200dpi for a stunning 1.44 million pixels per square inch.

GST Ex: \$2,459 + GST: \$245.90 (89186) GST INC **\$2,704.90**

Also available, the Champion Comet is the first economical, desktop printer loader designed for the Signature II and III printers. The loader stacks up to 50 printable discs, then after printing, the discs are deposited into the output tray.

Comet Autoloader for Signature Printers

GST Ex: \$2,411 + GST: \$241.10 (97769) GST INC **\$2,652.10**

Verbatim CopySmart 4x4x32 CD Duplicator



Stand-alone or PC connected one-to-one duplicator able to record to both CD-R and CD-RW media. 4x CD-R, 4x CD-RW copy functions. Simple 4 button interface allowing speed selection, Test, Copy, Compare and Quick Erase. PC based Data and Audio copying Software included.

4x Write, 4x ReWrite, 32x Read

GST Ex: \$1,520 + GST: \$152.00 (92173) GST INC **\$1,672.00**

LOW PRICE

Verbatim Slim-line PC Card CD-ROM Drive



Add a CD-ROM to your Laptop!

This 24xCD-ROM can connect to any PC Card enabled PC or Notebook and is ideal for mobile computing for notebook users with no CD-Rom drive built-in. The drive is plug-and-play making installation a breeze and the slim-line tray reduces the size of traditional external PCMCIA CD-ROM drives through its lightweight and low profile design. The control panel on the top of the case allows for easy playback of audio CD's.

GST Ex: \$287 + GST: \$28.70 (97766) GST INC **\$315.70**

Verbatim 56K Compact Modem



Compatible with Windows® CE based Palm PCs & Handheld PCs

The Pretec CompactModem from Verbatim is the world's first and smallest 56kbps Fax/Modem card for Windows CE based Palm PCs and handheld PCs. Video conferencing ready. Supports V.80 application for synchronous H.324 streaming. Supports V.90 and K56flex. Win 95/98/NT /CE compatible. By connecting the CompactFlash adapter included, this modem also becomes a fully-fledged PC card able to be used with most laptops/notebooks.

GST Ex: \$255 + GST: \$25.50 (83607) GST INC **\$280.50**

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CD-R/CD-RW: Storage for life

Verbatim CD's represent the latest in technology. Featuring a proprietary blue Metal-Azo dye which has the best resistance to sunlight, silver reflective layer for optimum read and write performance and multispeed recording.

Verbatim CD Recordable and Rewritable Discs

CD Recordable- 10 Pack

74 Min. 650 MB 1x - 12x 10 pack



GST Ex: \$20
+ GST: \$2.00
(76731) GST Inc:
\$22.00

CD Recordable- 10 pack in sleeves

74 Min. 650 MB Multispeed Envelope 10 pack



GST Ex: \$18
+ GST: \$1.80
(A3160) GST Inc:
\$19.80

CD Recordable- Singles

74 Min. 650MB Multispeed Singles



GST Ex: \$2
+ GST: \$0.20
(74740) GST Inc:
\$2.20

CD Recordable- 80 Minute

74 Min. 650 MB Multispeed



GST Ex: \$2
+ GST: \$0.20
(87392) GST Inc:
\$2.20

CD Recordable- Printable Surface

74 Min. 650 MB Printable Surface 50 spindle pack



GST Ex: \$90
+ GST: \$9.00
(93471) GST Inc:
\$99.00

*Printable surface
also available in
jewel-case

Audio CD Recordable

74min Audio CD Recordable



GST Ex: \$3
+ GST: \$0.30
(A2336) GST Inc:
\$3.30

CD Rewritable

533MB CD Rewritable Preformatted for Direct CD



GST Ex: \$6
+ GST: \$0.60
(A3171) GST Inc:
\$6.60

NEW!

CD Rewritable

650 MB CD Rewritable 2x 4x



GST Ex: \$5
+ GST: \$0.50
(77492) GST Inc:
\$5.50



CD Travel Case

Lightweight.
Scuff proof
exterior.
Fabric lined disc
holders
prevent scratching
and sticking
of CD's.



For 24 CDs:
(79583)
GST Ex: \$18
+ GST: \$1.80
GST Inc:
\$19.80



For 48 CDs:
(79584)
GST Ex: \$25
+ GST: \$2.50
GST Inc:
\$27.50

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Vertical in-ear
stereo headphone
with adjustable
microphone
boom. Ideal for
notebook users.
Designed for
multimedia
convenience.
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compact,
adjustable
headband. (Must
be powered by
a soundcard)
(77819)
GST Ex: \$17
+ GST: \$1.70
GST Inc:
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SEP
29



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**Mini
Wheel
Mouse**
GST Ex: \$64
+ GST: \$6.40
(97717)
GST Inc:
\$70.40



**MouseMan
Wheel
Optical**
GST Ex: \$89
+ GST: \$8.90
(A3057)
GST Inc:
\$97.90



**TrackMan
Live**
Cordless
freedom for
interactive
presentations,
works up to
10 metres
away from the
computer.
GST Ex: \$239
+ GST: \$23.90
(77753)
GST Inc:
\$262.90



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A2833, 70566,
A2157, A2300
or 78677
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30/9/00

SEP
30

Surround yourself with the very best

Cordless Desktop iTouch

A cordless keyboard and cordless wheel mouse combination to free you from cords that tangle. No pointing at the computer or clear path required. With convenient iTouch Internet and multimedia controls. Five-year warranty.



GST Ex: \$152
+ GST: \$15.20
(82772)
GST Inc:
\$167.20

Cordless Desktop Pro

Cordless keyboard designed for easier typing and contoured soft-touch cordless wheel mouse free you from tangled cords. Innovative mouse design maximises comfort and control. Five-year warranty.



GST Ex:
\$206
+ GST:
\$20.60
(87605)
GST Inc:
\$226.60

QuickCam™ Express

Snap stills. Shoot video. Email them anywhere in one click. Make live video calls! **QuickCam™ Express** – The simple way to get closer™.

- Capture stills and video instantly
- Email images with a single click
- Meet face-to-face online
- Over 3 million QuickCams sold
- USB connector for easy installation
- Works with Windows® 95 or 98



GST Ex: \$81 + GST: \$8.10
(80121) GST Inc: **\$89.10**

QuickCam™ Web

The redesigned Logitech QuickCam Web has everything you need to capture video, send video e-mail, make live video calls, post web albums, broadcast over the Internet and more. With its integrated microphone and excellent assortment of easy-to-use software, QuickCam Web is the perfect Internet video camera for everyone.



GST Ex: \$158
+ GST: \$15.80
(A2833) GST Inc: **\$173.80**

QuickCam™ Pro USB

True 640x480 resolution for stunning videos & pictures. With the **QuickCam** software, build fun web pages complete with streaming video or make live video calls (includes a Labtec microphone) over the Internet. Add titles, fade-in & fade-outs, audio tracks & more to your videos. Enhance your pictures with special effects such as sharpen, blur & more. And with the included digital surveillance software, easily set up a digital security camera.



GST Ex: \$193 + GST: \$19.30
(70566) GST Inc: **\$212.30**

CordlessTrackMan Wheel

Experience true comfort and freedom. Thanks to Digital Radio technology, this innovative trackball works without being pointed at the computer, even on crowded desks. **Patented optical technology delivers** superior precision, reduced wear and smooth tracking. Five-year warranty.



GST Ex: \$150 + GST: \$15.00
(A2157) GST Inc: **\$165.00**

Cordless Wheel Mouse Special Edition

Personalise your mouse with the three different colored snap-on backs. The Cordless Wheel Mouse frees you from cords that catch, tangle and limit your movement. The rounded shape is comfortable for left or right hand. 5-year warranty.



GST Ex: \$72 + GST: \$7.20
(A2300) GST Inc: **\$79.20**

Cordless MouseMan Wheel

Cordless MouseMan Wheel combines cordless freedom of movement and a comfortable shape with unique soft-touch sides, an easy-scrolling wheel and four customizable buttons. It eliminates the struggle with cords, works without being pointed at the computer and performs on crowded desks. Five-year warranty.

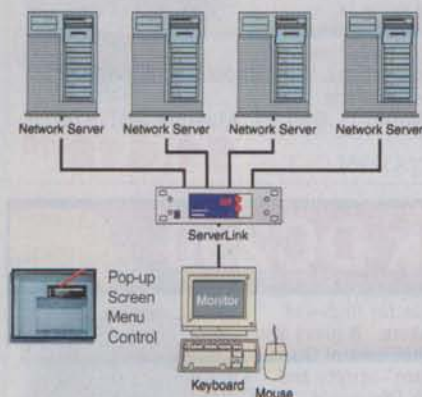


GST Ex: \$81 + GST: \$8.10
(78677) GST Inc: **\$89.10**

Multi-Server Controllers

Control up to 256 network servers with a single monitor, keyboard & mouse

With a ServerLink KVM switch you can monitor and fully control up to 256 network servers with just one monitor, keyboard and mouse. Save money on expensive monitors, create more working space and cut down on your power costs.



Designed and manufactured in Australia by an award winning engineering company, ServerLink is packed with features, providing total control of your ever expanding network.

- Select servers via On-Screen-Display or Front Panel
- Name servers for simple selection
- Mouse & keyboard emulation for flawless booting
- Scan Mode for periodic server monitoring
- Standard cables used throughout
- Cascadeable to control up to 256 servers
- 8 and 16 port models 19 inch rack mounted design
- Australian designed and manufactured

FROM **\$349.80**

3 Year Warranty

ServerLink to computer cable

Each end of the cable fans out into three connectors.

2m cable for PS/2 mouse, keyboard and monitor

GST Ex \$26 + GST \$2.60 (63972)

GST INC **\$28.60**

5m cable GST Ex \$58 + GST \$5.80 (63976)

GST INC **\$63.80**

2m cable for AT/Serial mouse, keyboard and monitor

GST Ex \$25 + GST \$2.50 (63974)

GST INC **\$27.50**

5m cable GST Ex \$56 + GST \$5.60 (63977)

GST INC **\$61.60**

ServerLink™

- EPROM upgradeable for future technology
- Supports PS/2 and Serial mouse emulation



SL-401E	4 Port ServerLink Controller for PS/2 only	GST Ex \$318 + GST \$31.80 (71652) GST INC \$349.80
SL-401	4 Port ServerLink Controller	GST Ex \$670 + GST \$67.00 (63724) GST INC \$737.00
SL-801	8 Port ServerLink Controller	GST Ex \$1,119 + GST \$111.90 (63777) GST INC \$1,230.90
SL-1601	16 Port ServerLink Controller	GST Ex \$1,881 + GST \$188.10 (63778) GST INC \$2,069.10

SERVERLINK INFINITY

PS-2 ONLY

- Password protection for security
- Flash ROM upgradeable for future technology



SL-821	8 Port ServerLink Infinity controller	GST Ex \$974 + GST \$97.40 (97888) GST INC \$1,071.40
SL-821-P	8 Port ServerLink Infinity controller incl 8x2m Cables	GST Ex \$1,131 + GST \$113.10 (97889) GST INC \$1,244.10
SL-1621	16 Port ServerLink Infinity controller	GST Ex \$1,633 + GST \$163.30 (97890) GST INC \$1,796.30
SL-1621-P	16 Port ServerLink Infinity controller incl 16x2m Cables	GST Ex \$1,934 + GST \$193.40 (97891) GST INC \$2,127.40

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SEP
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Kodak



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Taking Pictures Further

Kodak Accessories 32MB

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(62677)
GST Ex: \$156
+ GST: \$15.60
GST Inc:

\$171.60

64MB

Picture Card

(82249)
GST Ex: \$241
+ GST: \$24.10
GST Inc:

\$265.10

96MB

Picture Card

(88332)
GST Ex: \$369
+ GST: \$36.90
GST Inc:

\$405.90

Premium Camera Bag

(82273)
GST Ex: \$53
+ GST: \$5.30
GST Inc:

\$58.30

80 Minute

Ultima

(94493)
GST Ex: \$2
+ GST: \$0.20
GST Inc:

\$2.20

Kodak Gold

10 Pack

(53993)
GST Ex: \$21
+ GST: \$2.10
GST Inc:

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SEP

32

Kodak DC5000

Rugged, durable, and easy-to-use, the KODAK DC5000 will help you get the job done. Whether you're in the construction industry, insurance, or an outdoor enthusiast, the DC5000's weatherproof body will hold up under the toughest circumstances. Two-megapixel resolution provides you with excellent picture quality even on 8" x 10" prints. The 2X optical (30 - 60 mm) and 3X digital zoom let you choose wide angle or telephoto to take pictures in a variety of open spaces. All in all, a practical, intuitive package that is as easy to use as a point and shoot, but tough on the job



GST Ex: \$1,177 + GST: \$117.70

(A3540) GST Inc: **\$1,294.70**

Kodak DC280

Fast, responsive and sophisticated, the KODAK DC280 means business. Its intuitive design and responsive performance mean there's little learning curve. The DC280 lets you capture business images quickly and professionally. And then put them to work immediately.



- 2 Million Pixel Resolution
- 2x Optical and 3x Digital Zoom Lens
- USB compatible
- 8MB Picture Card
- Photodeluxe Pagemill and Photoprinter Software
- Rechargeable batteries and charger included

GST Ex: \$805 + GST: \$80.50

(80361) GST Inc: **\$885.50**

Kodak EZ200

NEW!

Low cost digital point-and-shoot camera that's also a PC/web camera. Compact & light. VGA camera - ideal for easily emailing pictures. Capture short video clips and share via video email. Portable like a traditional camera, but included software also allows camera to be tethered to PC for live video calls. Burst mode for action shots. USB interface. 4Mb internal memory. With removable/adjustable base to allow full tilting & swivelling.



GST Ex: \$Call + GST: \$Call

(xxxxx) GST Inc: **\$Call**

Kodak DVC 325

The KODAK DVC325 Digital Video Camera is the easy, fun way to capture and share quality digital pictures and video

- Full motion video up to 30 frames per second
- Great 640x480 Still Images
- USB Interface
- Create videos that include text, video, audio and special effects with Presto!
- Videoworks software included
- Standard Tripod Socket



GST Ex: \$134 + GST: \$13.40

(80362) GST Inc: **\$147.40**

Kodak DC4800

NEW!

For passionate digital photographers or those needing the highest possible quality or the widest creative controls. Compact size. 3.3 megapixels - super crisp resolution; prints up to 11"x17". Six image qualities, from e-mail to uncompressed Tif. Loaded with features. Variable ISO settings (100, 200, 400). Wide angle 3x optical zoom plus 2x digital zoom. Lithium ion rechargeable battery (rechargeable in camera). Manual & auto settings. Variable colour balance. TTL AF. Special effects. Lens threaded for additional external lenses.



GST Ex: \$1,471 + GST: \$147.10

Burst capture mode.* (A3295) GST Inc: **\$1,618.10**

Kodak DC290

The model of choice for high-end business picture takers. It gives you the ultimate in digital control thanks to its ability to "learn" scripts and applications—much like you'd customize your PC with different software.

- 2.1 Million Pixel Resolution
- Up to 3.3 Million Pixel Interpolated Resolution
- 3x Optical and 2x Digital Zoom
- JPEG and Uncompressed TIFF File Format
- Audio record and playback
- Burst capture mode
- 16MB Picture Card
- Rechargeable batteries/charger included



GST Ex: \$1,075 + GST: \$107.50

(84735) GST Inc: **\$1,182.50**

Kodak PalmPix

- Compatible with Palm III, IIIx, IIIe, VII, IBM Workpad and TRGPro.
- Portable: Take it everywhere
- Quick- take a picture, transfer by HotSync technology, and share it in seconds
- Color VGA Pictures- 640x480 pixel resolution.
- Zoom- 2x digital zoom
- Windows 95, 98, nT 4.0 or later compatible



GST Ex: \$281 + GST: \$28.10

(A2310) GST Inc: **\$309.10**

Kodak 4832 External USBWriter

NEW USB, 4x CDR Write, 4x CDRW Re-Write, Up to 8x Read. Dimensions 195(w) x 60(h) x 247(d) mm. Weight 2.53Kg. USB supported by Windows 98. PACKAGE CONTENTS- Your Kodak USB CD-R/RW drive, Recording Software CD and CD-R/RW drive Driver CD, USB connection cable, Power cable with universal power supply, KODAK Ultima CDR, KODAK 4832e User Manual.



GST Ex: \$531 + GST: \$53.10

(A2330) GST Inc: **\$584.10**

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Connected Organisers



Excellent Palm™ Computing from Harris Technology

Palm™ connected organisers manage life's little details. It will help you stay on top of things everywhere you go. You can store thousands - literally thousands - of names, addresses, phone numbers, to-do's, and expenses, plus hundreds of e-mail messages. You can synchronise all your information with your computer at the touch of a button. More features: Infrared communication. Access your e-mail with the Palm Modem® accessory. Applications: Date Book, Address Book, Mail, To-do List, Memo Pad, Expense, Calculator, Security, Games, HotSync®.



Palm m100

Connected Organiser
Compact, slim & stylish



**NEW
PRODUCT
COMING SOON!**

Stock expected
early September

GST Ex \$
(xxxxx) GST INC
\$Call

Palm IIIc™

Connected Organiser
Colorful



The Palm IIIc™ combines functionality and speed with advanced screen technology that renders a vivid, clear colour display. A rechargeable lithium ion battery lasts more than two weeks with normal use, and recharges in your HotSync® cradle in just minutes a day. An optional recharger kit is great when you're away from your PC. Stores approximately: • 10,000 addresses • 5 years of appointments • 3,000 to-do items • 3,000 memos • 400 e-mail messages • and lots of third-party applications.

GST Ex \$690 + GST \$69.00
(95059) GST INC
\$759.00

Palm Vx™

Connected Organiser
Slim, stylish, more storage



If you're looking for the sleekest device on the market, look no further than the Palm Vx™ organiser. Weighing in at just 114 grams, it has the same anodised aluminum exterior and LCD screen as the Palm V™ organiser. Yet it has four times the memory of its predecessor, giving you more speed and more storage. Stores approximately: • 10,000 addresses • 5 years of appointments • 3,000 to-do items • 3,000 memos • 400 e-mail messages • and lots of third-party applications.

GST Ex \$663 + GST \$66.30
(95061) GST INC
\$729.30

Buy a Palm Vx during
September and get a
FREE* half bottle of
Johnnie Walker Black
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includes free Delivery

*Redeemable via Vintage
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Redemption is only available to
persons over the age of 18.



Palm Slim Leather Case

GST Ex \$35
+ GST \$3.50
(63801)
GST INC **\$38.50**



Palm III 3-pack Styli

GST Ex \$15
+ GST \$1.50
(60675) GST INC **\$16.50**



Palm III Cradle

GST Ex \$50
+ GST \$5.00
(60673)
GST INC **\$55.00**



Palm V Cradle

GST Ex \$95
+ GST \$9.50
(74669) GST INC **\$104.50**



Palm V Leather Belt Clip Case

GST Ex \$46
+ GST \$4.60
(74673) GST INC **\$50.60**



Palm V Modem

GST Ex \$259
+ GST \$25.90
(74668)
GST INC **\$284.90**



Palm V Hard Case

GST Ex \$67
+ GST \$6.70
(74676)
GST INC **\$73.70**



Palm V Travel Kit

HotSync cradle, plug
adapters and AC charger
GST Ex \$82
+ GST \$8.20
(74677) GST INC **\$90.20**



Palm III series PalmGlove

Black:
GST Ex \$44
+ GST \$4.40
(82231)
GST INC **\$48.40**

Also avail: purple,
olive, royal blue, teal
and yellow



Palm III series Colour Shades

Pack of 3 flip covers in
blue, lime & aqua + 3
black plastic styli.
GST Ex \$21
+ GST \$2.10
(60677)
GST INC **\$23.10**



Palm™ Portable Keyboard

Leave your laptop in the office. Carry this pocket-sized keyboard to take notes at your next meeting or write reports on an airplane. Folds down small. Weighing in at less than 250 grams, this full-size keyboard tri-folds into a size just slightly bigger than a Palm™ organiser itself. Unfolded, it's the same size as your desktop keyboard. No batteries required.



Tri-fold Keyboard
Goes Anywhere!

GST Ex \$197 + GST \$19.70
(87210) GST INC **\$216.70**



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Zip 100MB disk:
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\$15.50 GST Inc: **\$170.50**
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accelerator card
(35145)
GST Ex: \$158 + GST:
\$15.80 GST Inc: **\$173.80**
Zip ISA SCSI Zoom
accelerator card
(21888)
GST Ex: \$53
+ GST: \$5.30
GST Inc: **\$58.30**
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GST Ex: \$42 + GST:
\$4.20 GST Inc: **\$46.20**
Zip parallel cable
(46305)
GST Ex: \$35 + GST:
\$3.50 GST Inc: **\$38.50**
Zip SCSI cable
(46304)
GST Ex: \$33
+ GST: \$3.30
GST Inc: **\$36.30**
Zip disk labels 20-pack
(48059)
GST Ex: \$3 + GST:
\$0.30 GST Inc: **\$3.30**
Zip 6-disk wallet
(35146)
GST Ex: \$23 + GST:
\$2.30 GST Inc: **\$25.30**
Jaz 1GB disk (24218)
GST Ex: \$144 + GST:
\$14.40 GST Inc: **\$158.40**
3-pack
(32844)
GST Ex: \$418 + GST:
\$41.80 GST Inc: **\$459.80**
Jaz PCMCIA SCSI card
(44744)
GST Ex: \$197
+ GST: \$19.70
GST Inc: **\$216.70**
Jaz universal
power supply
(35154)
GST Ex: \$44 + GST:
\$4.40 GST Inc: **\$48.40**
Clik! Power Supply
(78925)
GST Ex: \$26
+ GST: \$2.60
GST Inc: **\$28.60**

Zip 250MB

ZIP USB

Provides high-capacity storage in an easy-to-use format that can go from desktop to laptop quickly and reliably. Sleek new design. Connect via USB port or through PCMCIA card version which requires no additional power cables. Backward compatible with 100MB Zip media



ZIP 250MB USB:

GST Ex: \$295 + GST: \$29.50 (82633) GST Inc: **\$324.50**

Drive USB/PC card Combo

GST Ex: \$354 + GST: \$35.40 (82780) GST Inc: **\$389.40**CD-RW External
4 X 4 X 6

ZIPCD USB

The ZipCD™ external USB drive reads, writes and rewrites most CD formats. You can use it to record, back up, and share your files.

- It's portable and hot-swappable, letting you connect it to all USB-enabled computers without rebooting.
- It enables you to record and erase ZipCD™ discs up to 1000 times.
- Enable PC and Macintosh® computer users to record, archive, share, and distribute up to 650MB of data on a common CD format.

GST Ex: \$449 + GST: \$44.90
(92623) GST Inc: **\$493.90**

Zip 250MB

ZIP 250

Comes with 1 Zip 250MB disk. Iomega tools supplied on CD.

SCSI: GST Ex: \$253 + GST: \$25.30

(74451) GST Inc: **\$278.30**

Disks: Single: GST Ex: \$28 + GST: \$2.80

(74454) GST Inc: **\$30.80**

Disks: 10-pack: GST Ex: \$268 + GST: \$26.80

(74452) GST Inc: **\$294.80**CD-RW Internal
8 X 4 X 32

ZIPCD

Store your personal photos, original audio and video creations, multimedia presentations and data files. Backup your files & save space on your hard drive.

GST Ex: \$402 GST: \$40.20
(97712) GST Inc: **\$442.00**

Jaz 2GB External

JAZ

GST Ex: \$545 GST: \$54.50

(78941) GST Inc: **\$599.50**

The external Jaz 2GB drive is faster than many hard drives, has a full 2GB of storage space in each removable disk.

Disk Single:

GST Ex: \$152 + GST: \$15.20 (61652)

GST Inc: **\$167.20**

Disk 3-pack:

GST Ex: \$416 + GST: \$41.60 (57271) GST Inc: **\$457.60**

Jaz Firewire dongle: SCSI to USB connector

COMING SOON!!!

Does not include
Jaz disk.

PC Card Drive

CLIK!

Removable solution for notebook users. Store, protect and share important information on a 40MB Clik! (1 disk included).

Clik! USB docking station

GST Ex: \$109 + GST: \$10.90 (A2306)

GST Inc: **\$119.90**

Clik! Drive PC Card and disk

GST Ex: \$238 + GST: \$23.80 (78902) GST Inc: **\$261.80**

Clik! Drive Mobile

GST Ex: \$445 + GST: \$44.50 (76743) GST Inc: **\$489.50**

Clik! Disks 10-pack

GST Ex: \$169 + GST: \$16.90 (75985) GST Inc: **\$185.90**

Zip 100MB

NEW

USB Starter kit

USB Easy to connect. Comes with 3 disks. Plug it in, connect the USB cable to the computer, and install the IomegaWare™ software. Done!

GST Ex: \$235 + GST: \$23.50 (A2308) GST Inc: **\$258.50**

SPECIAL OFFER

With any purchase of a Zip 250MB, Jaz, Clik! or ZipCD drive...

receive a 3 month subscription to Australian Net Guide at no extra cost. And enter the draw to win free internet access for a year!

This promo ends 30th Sept 2000.

See www.ht.com.au/cat/iomega for more info on these products

Tools for the "E" Generation



GST Ex: \$293 + GST: \$29.30
(99757) **GST Inc: \$322.30**

ePhoto CL18

Dual Mode: (point-and-shoot digital camera with video conferencing, video clipping and video e-mailing features), VGA (640 x 480 pixels) optical resolution with CMOS sensor, 32 images on internal 2Mb memory (non removable), Optical viewfinder, Built-in Flash, ISO 200, Includes camera cradle for video conferencing, USB interface. Excellent s/w bundle (Twain driver, Corel PrintHouse, Corel PhotoHouse, Microsoft NetMeeting, ArcSoft VideoImpression)



SnapScan e50

1200 x 2400 optical resolution (9600 maximum), 42 Bit, USB interface, Integrated TPO for transparency and negative scanning, 4 front panel buttons (programmable), 3 interchangeable coloured handles and button covers. Agfa ScanWise and comprehensive software package including Corel Print Office 2000 and Readiris.

GST Ex: \$382 + GST: \$38.20
(99759) **GST Inc: \$420.20**

ePhoto CL30 Klik!

The fantastic ePhoto CL30 now available with built-in Iomega Klik! Drive. Mega-pixel digital camera with USB interface and a resolution of 1440x1080 pixels. Features an optical viewfinder and 1.8" colour LCD screen. Auto focus lens with 2x digital zoom and macro function.



GST Ex: \$989 + GST: \$98.90
(89409) **GST Inc: \$1,087.90**



SnapScan 1212u

One pass, high quality 600x1200ppi scanner (9600ppi max.) with USB interface. Includes Caere OmniPage LE OCR, Caere PageKeeper, Corel Print-House Magic Select & Agfa's incredible ScanWise software. Mac and Win98/Win2000 compatible "Best Scanner 1999" - PC World magazine

White
GST Ex: \$192 + GST: \$19.20
(74496) **GST Inc: \$211.20**

SnapScan Touch

Agfa's revolutionary Snap-Scan Touch USB Scanner has four programmable buttons: scan direct to file, email, fax or printer. 600x 1200 ppi, 36 bit, landscape desktop scanner. Comes with 7 translucent coloured handles! Software: Agfa ScanWise, Caere OmniPage LE, Caere PageKeeper (PC only) Micro Frontier Color IT! (Mac only) and Corel Print House



GST Ex: \$208 + GST: \$20.80
(87209) **GST Inc: \$228.80**



SnapScan 1212p

One pass, high quality 600x1200ppi scanner (9600ppi max.) with parallel interface. Includes Caere OmniPage LE OCR, Caere PageKeeper, Corel Print-House Magic Select & Agfa's incredible ScanWise software. Compatible with Win95/98/NT. 36-Bit

GST Ex: \$163 + GST: \$16.30
(74495) **GST Inc: \$179.30**

SnapScan e40

1200x2400 optical resolution (9600 maximum), 42bit, USB interface, 3 interchangeable coloured handles. Agfa bundles Corel Print Office 2000 and Readiris. Corel Print Office makes it easy to create impressive documents and Web pages. Readiris, which recognizes 55 languages, lets users easily convert hard-copy documents — originals, faxes and photocopies — into editable text. All software provided is available in 5 languages, for both Windows (including Windows 2000) and Macintosh platforms.



GST Ex: \$313 + GST: \$31.30
(84306) **GST Inc: \$344.30**

More from Agfa...



DuoScan HiD (92981)
GST Ex: \$3,476
+ GST: \$347.60
GST Inc: **\$3,823.60**

Transparency adapter for SnapScan 1236. Moving light source. 203x254mm. (76779)
GST Ex: \$276
+ GST: \$27.60
GST Inc: **\$303.60**

Document Feeder for DuoScan T1200. (75581)
GST Ex: \$379
+ GST: \$37.90
GST Inc: **\$416.90**

Batch Slide holder set for DuoScan T1200. (75582)
GST Ex: \$203
+ GST: \$20.30
GST Inc: **\$220.30**



DuoScan T1200 SCSI-2. 36 bit. Transparency scanning. Opt. res. 600x1200ppi (74498)
GST Ex: \$1,244
+ GST: \$124.40
GST Inc: **\$1,368.40**



DuoScan T2500 SCSI-2. 36 bit. Transparency scanning. True opt. res. 1250ppi (74499)
GST Ex: \$7,995
+ GST: \$799.50
GST Inc: **\$8,794.50**

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HP ScanJet 3400C

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- WYSWYG capability
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- Presicion Scan LTX software



GST Ex \$262 + GST \$26.20 (A2285)

GST INC **\$288.²⁰**

HP ScanJet 4300C

Scan/copy/e-mail
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- WYSWYG compatability
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- Windows 2000 support
- Presicion Scan LTX software
- Corel Print House 2000



GST Ex \$343 + GST \$34.30 (A2286)

GST INC **\$377.³⁰**

HP ScanJet 5370C

Multiformat - Scan/copy/
e-mail and fax

- 1200 dpi optical resolution
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- Active transparency adapter
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- Presicion Scan Pro 2.5



GST Ex \$513 + GST \$51.30 (A2287)

GST INC **\$564.³⁰**

HP DeskJets

HP DeskJet 640C

HP's easy, everyday colour
inkjet printer

- Black and colour cartridges included - everything you need!
- Great results on plain paper
- Special projects made simple - greeting cards, envelopes & more
- Prints up to 6 ppm black and 3 ppm colour



GST Ex \$171 + GST \$17.10 (A2288)

GST INC **\$188.¹⁰**

HP DeskJet 840C

HP's creative photo-quality
colour, speed and flexibility

- Photo-quality with HP PhotoREt II
- Alternative 600x1200 dpi mode on photo paper
- Prints up to 8 ppm black and 5 ppm colour
- Exclusive HP inks dry fast for smudge-resistant text and images



GST Ex \$294 + GST \$29.40 (A2289)

GST INC **\$323.⁴⁰**

HP DeskJet 1125C

HP's affordable wide-format
colour printer

- Print any size from postcards (A6) to posters (A3+)
- Prints up to 7ppm black and 5.5 ppm colour
- Booklet printing - two-sided printing with automatic arrangement of pages for binding



GST Ex \$543 + GST \$54.30 (A2290)

GST INC **\$597.³⁰**

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- 75 speed dials, 55 page fax memory
- Up to 1200dpi enhanced (300dpi optical) scanning, 24bit colour.



GST Ex \$675 + GST \$67.50 (84356)

GST INC **\$742.50**

HP PSC500

All Colour: Printer, Copier & Scanner

The PSC500 provides incredible printing, scanning and copying at a great price! 1200 dpi printing on photo paper. 9600dpi enhanced scanning, 30 bit colour.



GST Ex \$670 + GST \$67 (A2299)

GST INC **\$737.00**

HP OfficeJet G95

High quality, Networkable All-in-One.

The OfficeJet G95 provides the highest quality printer/copier/scanner and standalone fax to network into your office workgroup environment. The OfficeJet G95 also comes standard with a duplexing unit.



GST Ex \$1,623 + GST \$162.30 (A0056)

GST INC **\$1,785.30**

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- 1200 x 1200 dpi (black and color) on all paper types.
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- PC/Mac Compatible
- Features one-click printer driver software installation, cartridge loading & ink level indicators.
- Accu-Feed™ paper handling virtually eliminates jams, wide range of media from envelopes to transparencies to paper stock up to 150 lbs.



GST Ex: \$164 + GST: \$16.40 (A3419)

GST Inc: **\$180.40**

Z42 Color Jetprinter

The Leading Edge in Photo Quality

- 2400 x 1200 dpi (black and color) on all paper types.
- Up to 10 pages per minute black, up to 5 pages per minute color.
- PC/Mac Compatible
- Features one-click printer driver software installation, cartridge loading & ink level indicators, & online product registration.
- Accu-Feed™ paper handling virtually eliminates jams, wide range of paper from envelopes to transparencies & everything in between.



GST Ex: \$240 + GST: \$24.00 (A3420)

GST Inc: **\$264.00**

Z52 Color Jetprinter

The Leading Edge in Photo Quality.

- 2400 x 1200 dpi resolution in both black & color
- Fast! Up to 15 pages per minute black, up to 7 pages per minute color
- PC/MAC Compatible
- Accu-Feed™ paper handling offers dependable feeding on a wide range of paper from envelopes to transparencies & everything in between
- One-click printer driver software installation



GST Ex: \$319 + GST: \$31.90 (A3421)

GST Inc: **\$350.90**

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GST Inc:
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Phaser 740 Laser Printer

740: Affordable colour laser printer with extraordinary print quality. For breathtaking images that leap off the page, at a breakthrough colour laser price, look to the Phaser 740.

Phaser 750 Laser Printer

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Phaser 750N

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Image Processor	133Mhz	200Mhz
Print Speed black/colour	16ppm/5ppm	16ppm/5ppm
Pipeline Printing	Optional	Optional
Duplex	Standard	Standard
	Optional	Optional
Code	(71836)	(A1401)
GST Ex + GST	\$3,930 + \$393.00	\$4,997 + \$499.70
GST Inc	\$4,323.⁰⁰	\$5,496.⁷⁰

740N Printer feature: 10BaseT Network-ready printing right out of the box

750N Printer feature: 10/100BaseT Network-ready printing right out of the box

Both printers feature: No developers or other special components that need regular service and Adobe postscript 3

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LaserJet and InkJet Printers



HP Business Inkjet 2200

The HP Business Inkjet 2200 has a higher print speed (normal mode) than any other HP inkjet. And, like the other two printers in the range, it's extremely cost effective.

- 15ppm black printing, 14ppm colour printing
- HP PhotoREtIII
- HPA™ installed
- 250-sheet input tray
- 8MB of memory
- One 96MHz Motorola processor on board



GST Ex \$Call
+ GST \$Call
(A3361) GST INC

\$Call

HP Business Inkjet 2250/2250TN

The HP Business Inkjets 2250 and 2250TN come with all the features of the 2200, and also include:

- HP PCL5Ce, HP PostScript level 2 emulation
- 24MB RAM upgradeable to 88MB
- Two 96MHz Motorola processors on board
- HP JetDirect 600N internal print server (2250TN only)
- Additional 250-sheet input tray (2250TN only)



GST Ex \$Call + GST \$Call (A3362/A3363) GST INC

\$Call

HP LaserJet 1100 Printer

HP's JetPath technology allows you the flexibility to expand the LJ 1100 into an all-in-one performer when your business needs grow. Crisp, sharp 600dpi laser printing. 8ppm. 2MB RAM.

GST Ex \$641 + GST \$64.10 (70095) GST INC

\$705.¹⁰

HP LaserJet 1100A Printer-Copier-Scanner

If your business needs require copying & scanning capabilities, move up to the LaserJet 1100A. Printing, copying and scanning: all-in-one. Make laser copies at the touch of a button. Scan resolution 600dpi enhanced, 300dpi optical.

GST Ex \$753 + GST \$75.30 (70096) GST INC

\$828.³⁰

HP LaserJet 2100 Series

All models feature:

- 1200dpi resolution
- 10ppm print speed
- 60MHz processor
- 350-sheet capacity
- 15,000 page monthly duty cycle
- Excellent performance

LaserJet 2100

A fast flexible laser with room to grow. EIO, PCL 6, 4MB RAM.

GST Ex \$1,115 + GST \$111.50 (72291) GST INC

\$1,226.⁵⁰

LaserJet 2100M

A fast flexible laser with PS and PCL. EIO, PCL 6, 8MB RAM.

GST Ex \$1,316 + GST \$131.60 (72292) GST INC

\$1,447.⁶⁰

LaserJet 2100TN

A complete network printer. EIO, PCL 6, 8MB RAM, additional 250-sheet feeder, HP JetDirect print server installed.

GST Ex \$1,484 + GST \$148.40 (72293) GST INC

\$1,632.⁴⁰

HP LaserJet 4050 Series

All models feature:

- 1200dpi resolution
- 16ppm print speed
- 133MHz processor
- 500-sheet capacity

LaserJet 4050

PCL 6, 8MB RAM.

GST Ex \$1,794 + GST \$179.40 (77443)

\$1,973.⁴⁰

LaserJet 4050N

PCL 6, 16MB RAM.

GST Ex \$2,236 + GST \$223.60 (77445)

\$2,459.⁶⁰

LaserJet 4050TN

PCL 6, 16MB RAM

GST Ex \$2,682 + GST \$268.20 (77446)

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A4 BJC-3000

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GST \$22.20
(94499) GST INC

\$244.²⁰

- Up to 9ppm print speed black
- 1440 dpi
- Separate replacement colours



GST Ex \$563 +
GST \$56.30
(95962) GST INC

\$619.³⁰

A3/A4 BJC-6500



LBP1000

10 pages per minute print engine at 1200 dpi resolution. Energy saving 'On-Demand' toner fusing. Cost-saving 'economy' printing mode. Powerful processor to ensure maximum throughput. Memory Saving Technology to accomplish more in less RAM. PCL6 Print Language emulation. Optional genuine Adobe® PostScript® 3™ printer language. Optional second 250 sheet paper feeder. Maintenance free 'all-in-one' toner and drum cartridge. 4 MB RAM standard - upgradeable to 36 MB.



GST Ex \$1,053 + GST \$105.30

(95983) GST INC **\$1,158.³⁰**



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BJC-1000SP

Super Economy Mode in black & white & colour. Vivid colours, on plain paper. Photo Mode colour, optional PhotoRealism. Auto image improvement. Print banners up to 6 A4 pages, envelopes, transparencies, glossy photo paper, high gloss film & T-shirt transfers.



GST Ex \$122 + GST \$12.20
(A1792) GST INC

\$134.²⁰

BJC-2100SP

High performance at a low price - the ultimate printer! Ultra compact design. Up to 5ppm in monochrome. Up to 2ppm in colour. 4-colour photo printing. Optional colour image scanning. Range of driver features. Banner printing. USB + parallel interface.



GST Ex \$160 + GST \$16.00
(A3173) GST INC

\$176.⁰⁰

BJC-6200

Compact design and uncompromised performance! Up to 10ppm in monochrome. Up to 7ppm in colour. 1440 x 720 dpi. 6-colour photo printing. Sharper, blacker text. Optional colour image scanning. Separate colour ink cartridges! USB + parallel interface.



GST Ex \$325 + GST \$32.50
(A3507) GST INC

\$357.⁵⁰

LBP800

Desktop laser, 8ppm, 300x300dpi, 600x600dpi and 2,400dpi with text and line smoothing. 512K buffer. 2,500 pages per cartridge (5% cover). Win® 95, 98 and NT 4.0.



GST Ex \$468 + GST \$46.80
(83787) GST INC

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- Plug & Play
- Fully integrated software package



NEW RANGE!

- Silent & fast scanning
- Super slim & compact

N650U

600x1200dpi.
GST Ex \$190 +
GST \$19.00
(A3522) GST INC

\$209.⁰⁰

N1220U

1200x2400dpi.
GST Ex \$244 +
GST \$24.40
(A3523) GST INC

\$268.⁴⁰

FB-1210U

1200x2400dpi
GST Ex \$407 +
GST \$40.70
(A3524) GST INC

\$447.⁷⁰

DIGITAL Ixus



Ixus is the worlds smallest digital camera with a zoom lens. 2.11 mega pixel with 8Mb flash card.

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(A3521) GST INC

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BJC-85

- Mac & Windows Multi-interface USB
- Up to 5ppm in monochrome
- Cordless printing
- Up to 2ppm in colour
- 720x360dpi
- Optional 4-colour photo printing



GST Ex \$324 + GST \$32.40
(A0993) GST INC

\$356.⁴⁰

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Next Generation Backup Solutions

MaxAttach NAS System



NEW!

Simplest way to add file services to any NT or Unix Network.

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(A2201) GST INC **\$3,058.00**

MaxC80: 80Gb
GST Ex \$3,908 + GST \$390.80
(A2204) GST INC **\$4,298.80**

MaxC160: 160Gb
GST Ex \$5,530 + GST \$553.00
(A2205) GST INC **\$6,083.00**



- Simply plug into your ethernet
- Only 5 mouse clicks to install....
- In 10 minutes you have 40, 80 or 160Gb of disk storage on line.
- Simple Web Browser administration.
- No NT licenses to buy!
- 95/98NT and Unix network compatible
- Now in 1 RU high models (4.5 cm high)
- Disk Spanning, JBOD or Raid level 1 built-in
- Free Reflect-It software to automatically backup you laptops or PCs.

Backup Software - TapeWare

TapeWare Lite: Single Server backup for NT, Network or Linux



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(97849) GST INC **\$467.50**

TapeWare - Loaded with features yet simple to use. TapeWare is simple to install and easy to administer whether you have a single PC or a large enterprise network.

- Quick Start Wizards set up most common applications quickly
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"Designed for price performance and superior reliability"

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(A2313) GST INC **\$2,746.70**

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(A2206) GST INC **\$3,157.00**

SLR100 (Internal)
• 50Gb native, 100Gb compressed
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GST Ex \$4,817 + GST \$481.70
(A2207) GST INC **\$5,298.70**

ECRIX VXA-1 Tape Drive

INTERNAL GST Ex \$1,558 + GST \$155.80 (91106) GST INC **\$1,713.80**

EXTERNAL GST Ex \$1,649 + GST \$164.90 (91110) GST INC **\$1,813.90**



- 33 GB Native, 66GB compressed
- 3-6MB sec sustained, that's 21.6GB/Hr
- SCSI-2 and LVD models available.
- Variable speed operation matches data throughput to your computer
- Packet based technology guarantees reliable restores
- LINUX approved
- Variety of case colours (*White, black, red, translucent)
- Compatible with most backup software

Benchmark DLT1 Tape Drive



INTERNAL
GST Ex \$2,908 + GST \$290.80 (88037) GST INC **\$3,198.80**

EXTERNAL GST Ex \$3,125 + GST \$312.50 (88038) GST INC **\$3,437.50**

- 40GB native, 80GB compressed
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- Reads DLT4000 tapes (20/40Gb Only)
- Internal or External models
- LINUX Approved
- 7 tape autoloader available
- Compatible with most common backup software
- Standard DLT form factor

Overland DLT1 Based Autoloader



NEW!

"Lowest Cost DLT compatible Autoloader on the market"

- 400 Gb native, 800 Gb compressed capacity
- DLT1 Single Tape Drive included
- 10 tape capacity
- Overland DLT reliability
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- 20 Gb/Hr throughput.
- Optional On-site warranty.

GST Ex \$7,786 + GST \$778.60
(A0476) GST INC **\$8,564.60**

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GST Ex \$6,781 + GST \$678.10 (41608) GST INC **\$7,459.10**

Quantum DLT8000/ST
GST Ex \$6,896 + GST \$689.60 (82501) GST INC **\$7,585.60**

DLTtape media
DLT2000XT 15/30GB Tape
GST Ex \$73 + GST \$7.30 (68362) GST INC **\$80.30**

DLT4000 20/80GB Tape
GST Ex \$128 + GST \$12.80 (71231) GST INC **\$140.80**

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Retrospect® Backup for Windows



Retrospect Clients

Adds support for more networked computers. With the addition of cross-platform Retrospect Clients, use Retrospect to back up your whole network, including Windows 95, 98, NT 4.0 Workstation & Server, Mac and Windows 2000 computers. Back up any client-equipped computer on the network without installing file servers, starting file sharing, or mounting volumes.

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server

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GST INC
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Retrospect

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for your entire
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Retrospect Express Backup makes it fast and easy to back up, restore, and archive. With an interface that's easy to navigate and backups that can be accomplished in a few quick steps, Retrospect Express eliminates the hassle and inefficiency of dragging files from one volume to the next. Features include:

- **Easy, automated backups:** Backups launch automatically to run unattended on any schedule.
- **Reliable one step restores:** Restores an entire hard disk in a single step even after multiple incremental backups.
- **Device Support:** Simplifies Installation by immediately recognising your backup device and automatically loading the appropriate driver.
- **Compression and Encryption:** Dramatically improves storage media capacity and decreases media costs.
- **IncrementalPLUS Technology:** After the initial backup, Retrospect Express backs up only new or changed files, saving time and storage media.

Retrospect Desktop Backup is the ultimate tool for backing up a single workstation to any storage media. It combines performance, unattended operation, low administration costs, and a complete feature set within an intuitive interface. Retrospect Desktop Backup builds on the features of Retrospect Express Backup with:

- **Expanded Device Support:** Supports most tape drives/autoloaders up to 8 slots.
- **Network Ready:** Adds support for another 5, 10, 50, or 100 networked computers to your copy of Retrospect Backup with Retrospect Clients.
- **Compression and encryption:** Dramatically improves storage media capacity, decreases media costs. Provides security for confidential files.
- **IncrementalPLUS™ technology:** After the initial backup, Retrospect backs up only new or changed files, saving time and storage media.
- **Duplicates:** Performs immediate or scheduled copying of any local volume, network volume, or folder to any other.
- **Archiving:** Store little-used files onto media to reduce free up hard disk space.
- **Expanded Device Support:** Supports most tape drives/autoloaders up to 8 slots.

Retrospect Workgroup Backup provides powerful backup for your entire workgroup across the network to a single storage device. Integrate both desktop computers and notebooks who connect to the network at irregular times into the same backup schedule. Includes all the features of Retrospect Desktop Backup listed above, plus:

- **Central administration:** One person can manage all backup functions: eliminates lengthy user training and difficult installation at each workstation.
- **Backup Server™:** Determines which computers are most in need of backup and backs them up in order of priority, including notebooks.
- **Advanced security:** Prevents unauthorized access to sensitive data with password protection while retaining individual user's privacy. Encrypts network transfers for additional security.

INCLUDES THE RETROSPECT APPLICATION PLUS 20 CLIENTS

Retrospect Server Backup includes all of the features found in Retrospect Desktop Backup and Retrospect Workgroup Backup, as well as advanced networking capabilities.

- **Powerful networking:** Uses your existing network configuration to back up clients on any subnet. Includes powerful subnet broadcast and direct IP access for multi-network environments. INCLUDES THE RETROSPECT APPLICATION PLUS 100 CLIENTS

"Retrospect 5.0 Server Edition proved itself in every test... it earns a recommendation from the CRN Test Center." *Computer Reseller News*

"Dantz backup system's flexibility, easy of use should make it a winner... it might well become an overnight sensation." *PC Week*

"Retrospect has several unique technologies that differentiate it from other backup products.... an excellent package." *IT Graphics*

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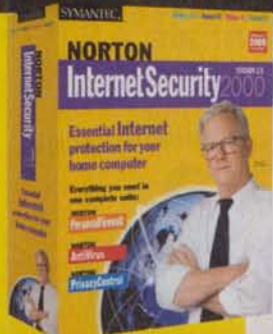
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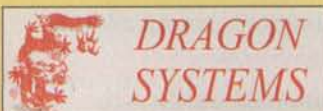
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SEP
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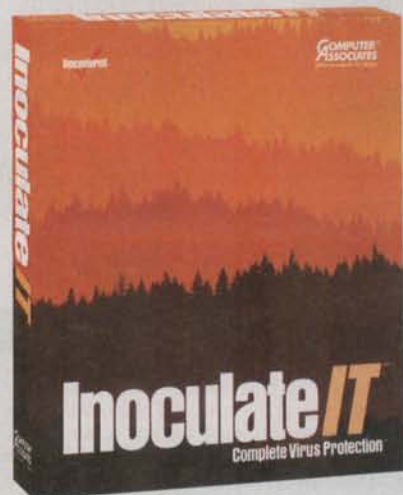
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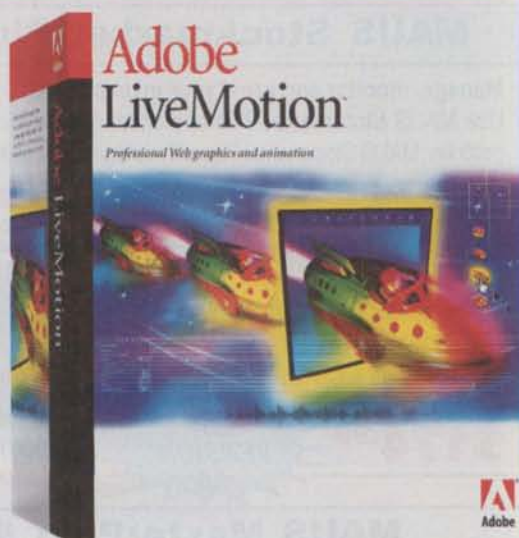
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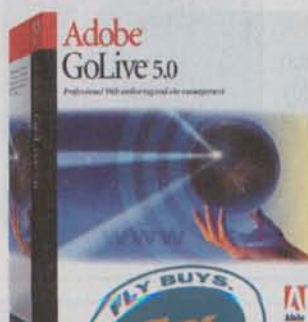
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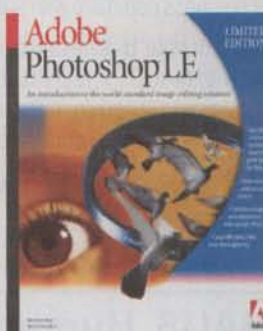


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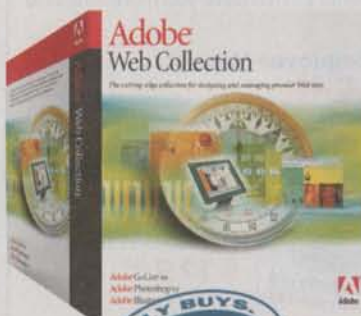


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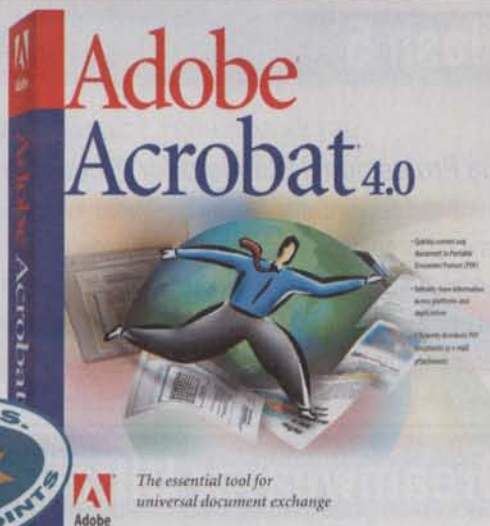
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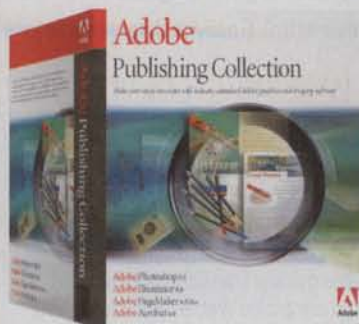


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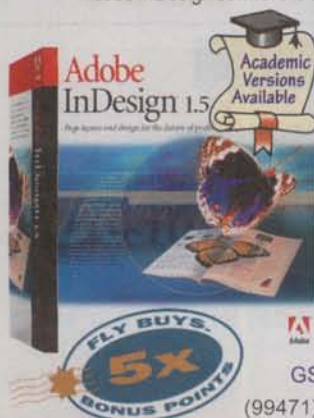


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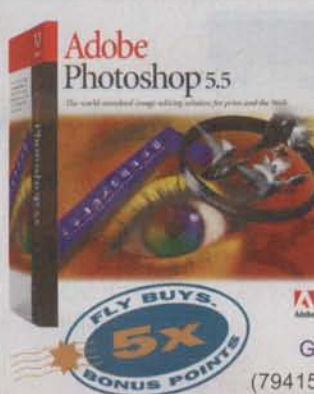


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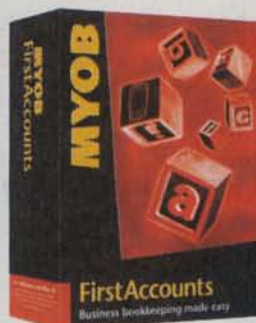


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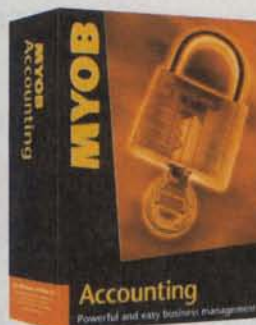
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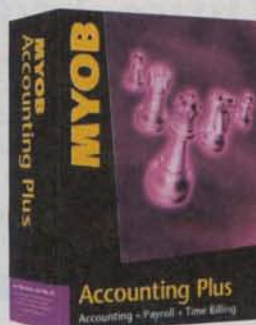
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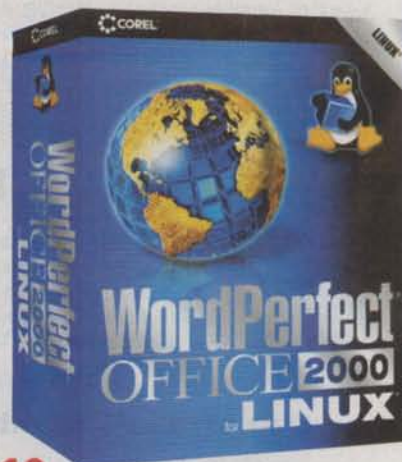


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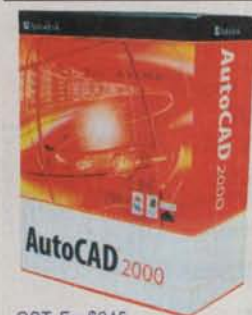
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Small Business Tools		✓	✓	✓	✓
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- Access 2000 - Database package used to create simple, useful databases, with improved interface to other Office 2000 applications
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Combine strategy and shooting skills to save planets from space parasites.

Survival of the fittest

Evolve

Evolve is an interesting breed of game: it's part strategy, part third person shooter. The premise is simple: thanks to advances in genetic engineering, the human race has evolved far beyond Homo sapiens as we are today. Gone are the days of engineering livestock and pets; we've moved onto genetically engineering ourselves, and now a group called the genohunters can adapt genetically at will.

As the human race spreads throughout space, we encounter another species called The Parasite. This species lands on planets and rapidly overtakes them. It kills all indigenous life and moves on. As a space explorer, and an Evolve, your task is to find planets attacked by The Parasite and intervene with as little impact on the native flora and fauna as possible.

The Evolve's role is to sit in the orbiting spaceship and control four genohunters on the planet's surface. Controlling their ability to transform genetically involves strategic planning. This distinguishes Evolve from standard shoot-'em-up games.

Each time your genohunters come across a carcass, they can gather genetic material from it and evolve using those genes. This can help you adapt to the environment or fight better. Each carcass can



offer two evolution methods at a time, but in the higher levels you have to choose your mutation paths carefully. With four genohunters this can lead to some interesting variations.

The play screen is split into five parts: the main screen, and four smaller screens across the bottom. These smaller

screens contain map information for the current genohunter being controlled, plus smaller versions of the other three genohunters' views. The graphics are gorgeous and nicely rendered, and the control system is an uncomplicated keyboard/mouse combination. For the first few levels, the design is fairly straightforward

Darren Ellis



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● European-based publisher Eidos has signalled that the business is definitely in the market to be acquired by, well, by whoever has the money. This seems strange because Eidos holds a number of huge franchises, including the massively lucrative Tomb Raider series. However, Eidos representatives stated that it was mainly loss of profit, due to the "transition to next-generation console systems" that forced its hand. Industry sources have been quick to point out that the tens of millions pumped into such dogs as Ion Storm's execrable Daikatana haven't helped the Eidos bottom line either. Apparently, Eidos is already in the early stages of talks with a buyer, and the rumours are flying thick and fast about just who that might be. The current line up includes France's Infogrames, Havas Interactive, and of course everyone's favourite monopoly: Microsoft.

● Speaking of Microsoft, it recently snapped up development house Bungie. This was a poke in the eye to Macintosh fans, as Bungie was one of the longest serving and best Mac game developers, and the chances of Bungie continuing to develop for Macintosh in the future are very low. Bungie staff are, apparently, extremely happy with the deal — and who can blame them. They now have squillions of bucks worth of resources behind them, and get their own building in Microsoft's compound.

● Lastly, barring any major mishaps, by the time you read this you should be able to trundle on down to your favourite software store and grab yourself a copy of a great selection of games that we've all been waiting for for a long, long time. As I write, *Diablo II* is finished and ready to go, *Dark Reign 2* has gone gold, *Giants* is rumoured to be complete, and *Black & White* is also, apparently, ready to go. Oh, wait, it's only September, right? Sorry, my mistake! Expect several of these games to be 'unavoidably delayed' until late November. The marketeers seem to think that if there are 15 AAA releases in the space of a week, we'll buy them all just because it's near Christmas.



Cricket 2000

Cricket 2000 is an upgraded version of Cricket World Cup 99. Are there enough changes to justify buying the game again? We don't think so. Most of the new features (revised team lists and statistics, additional stadiums and night games) could have been made available as a free download for owners of Cricket World Cup 99. After all, updated team lists and stats were issued during last year's World Cup competition.

The main change to the game is an additional control method for batting and bowling. The usual batting control with an onscreen cone indicating the direction of the shot has been augmented with a no-clues directional mode. The shot direction must be set with either the numeric keypad or a game controller's d-pad at



exactly the same time that the stroke is selected. A set of alternative controls is also available when bowling.

It would have been good to see Melbourne's Colonial Stadium included in the new arenas so that the indoor series against South Africa could be simulated. Surprisingly, the MCG — the home of Australian cricket — is also missing.

The changes are relatively minor, but the full retail price of Cricket 2000 is about \$15 more than Cricket World Cup 99. About one-third of the price increase is due to the GST, but we can't see 20% more value in the latest version.

Stephen Withers and Daniel Withers

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Classification G
Rating ■■■■■■

Euro 2000

If you didn't like the outcome of the Euro 2000 soccer tournament, you might get a better result with EA Sports's version. You can play the entire tournament controlling one team, while the computer simulates the other matches. The commentary includes scores from other matches in your group. Other choices are one-off friendlies or 'golden goals' matches where the winner is the first team to score a certain number of goals. Match preparation consists of 'skill drills' including passing, heading and shooting. Practice here pays off during matches. If you finish a complete tournament you can replay the semifinals and final from a previous championship.

The commentary by John Motson, Des Lynam and Mark Laurensen improves on



FIFA 2000 as the players' names are used more often. Players are generally more life-like, but their faces are still not recognisable. The overall appearance of the stadiums is also more realistic. The default controls for keyboard or gamepad are the same as other EA Sports games. Multiple human players are supported on the same or opposing sides, and multiple computers can be connected via LAN, serial or modem connections.

If you already own a recent soccer sim, Euro 2000 is not a big improvement, but it's a good buy if taken on its own merits.

Stephen Withers and Daniel Withers

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Phone (07) 5561 2828
Online www.easportseuro2000.com
Price \$69.95
Requires Pentium 133, Windows 95, 32M RAM
Classification G
Rating ■■■■■■

Allegiance

Allegiance is an online-only multiplayer game that is something like Tribes. It's a team game where players can take on a number of different roles — anything from fighter pilot and turret gunner through to external commander and strategist.

Like Tribes, there's a lot to learn. You can't just jump in and fly; even your average fighter pilot has to know how to communicate with team mates and the commander, and how to manage the team funds. Players pool their resources for the commander to invest in researching new technologies and building new bases.

A commander must earn the respect of the crew. Otherwise, the players can usurp the commander and install one of their own. However, a commander can also



remove troublesome players from the team. Each has a job to do; if it isn't done well the team will suffer.

This is by far the most enjoyable aspect of the game. Every flight is about taking or defending ground. How well you play has a direct bearing on the success of your team. Heroes can also emerge, destroying an enemy bomber or letting loose the missile that destroys an outpost.

Allegiance offers a compelling mix of real time strategy and classic space sim action. It demonstrates why multiplayer online games are more enthralling than single player games.

Ashton Mills

Contact Spin Communications

Phone (02) 9360 3377

Online www.microsoft.com/games/allegiance/home.htm

Price \$76

Requires Pentium II 300, Windows 95, 64M RAM

Classification G

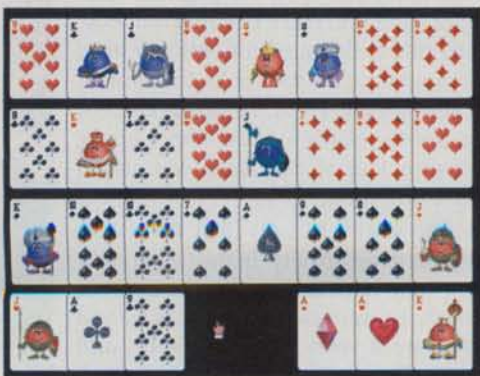
Rating ■■■■■■■■

Solitaire Suite

As a software development strategy, reinventing the wheel has only ever worked for Microsoft. So how do you go about selling a new version of Solitaire, a game that has featured in every version of Windows for over a decade?

Solitaire Suite tries to solve the problem with variety. It offers 21 variations on the familiar Patience theme, including the well-known Clock and more obscure options like Sir Tommy. It's a tribute to human ingenuity that so many games using the same basic elements have been created, but whether you'll want to memorise the rules for all 21 is another matter.

Arsenal Software has also spiced things up a little by including individual animations and sound effects for each card, and



a truly ghastly selection of background music. Fortunately, this can be switched off. Gameplay conforms to the standards you'd expect (simple clicking to select and move cards) and the help explaining each variation is reasonably comprehensive.

If you are a big fan of standalone card games, then Solitaire Suite delivers. The price is reasonable, but there are plenty of freeware alternatives available. Something compelling about the Windows version hasn't quite made it into these flasher alternatives. One for dedicated cardshark only.

Angus Kidman

Contact Manacomm

Phone (07) 3870 4900

Online www.ars.ru/eng

Price \$32.62

Requires Windows 3.1

Classification G

Rating ■■■■■■■■

Travelbox Hotel Guide

The Travelbox Hotel Guide was originally developed in Germany and then localised by Melbourne distributor Dataworks. It offers connected bookings via an associated Web site, and a few frills like currency conversion and support for 11 languages.

You can search by destination, cost or facilities, and you can automatically generate reservation forms. The range of local hotels is also quite good, even covering towns with populations of under 5,000.

If you do find yourself constantly checking for accommodation information for your business trips, then the Hotel Guide might be worth it. You might even want to spring for the regular update service. For the once-a-year traveller, though, free online resources are still a better bet.

Angus Kidman

Contact Dataworks

Phone (03) 9764 8344

Online www.tourisline.com

Price \$54.95

Requires 486/SX, Windows 95, 8M RAM

Classification G

Rating ■■■■■■■■

Trip Planner Deluxe

Planning a driving holiday involves poring over road maps, guidebooks, motel chain directories and so on. National Geographic's US Trip Planner Deluxe combines these resources in one package.

Once you've located all your stops, Trip Planner generates a route, highlights it on the map, and gives detailed driving directions ("Turn RIGHT onto Keyes St. Go 0.6 miles.") You do have some control over the route such as avoiding freeway-style roads or visiting a particular place. Be sure to read the manual or help files because the user interface isn't highly intuitive.

Attractive and usable maps can be viewed and printed at different scales. If only there was a comprehensive Australian equivalent.

Stephen Withers

Contact Mattel Interactive

Phone (03) 9425 5222

Online www.nationalgeographic.com

Price \$141.50

Requires 486/66, Windows 95, 16M RAM

Rating ■■■■■■■■

INTERACTIVE

Syd Break

As well as running a gym and exercise centre in Sydney, the Heart 2000 health and fitness company has developed a range of products to improve health and wellbeing. Syd Break is a five-minute stretch program that reminds you to take a break from your PC.

There are many shareware alarm programs available on the Web, but it's not easy to find one that is well designed. Syd is simple, fun and effective. You can set a timer so that Syd interrupts you as frequently as you want. You should never go longer than an hour, and a maximum of half an hour is recommended by most ergonomists.

The character of Syd is an animated plasticine model. He's much more effective than a cartoon for demonstrating the stretches. These are well-designed stretches for the upper body. You can easily quit the program if you wish to continue working; it will just pop up again at the next interval, or you can initialise it yourself when you're ready.

The voiceover becomes irritating once you're familiar with the routine, so you'll probably prefer to keep the sound turned down. However, this means you can't hear the relaxing music that accompanies the voiceover. It would be nice to have the option to play the music only. The ability to opt for a random selection would be another design plus, as you get the same exercise routine and same voiceover every time.

These gripes aside, an animated program is more likely to encourage you to take a break than an alarm that simply freezes your screen. Even if you press the Exit button half the time, you'll still be doing yourself a big favour.

Lindsay Hayman

Contact Heart 2000
Phone (02) 9439 1188
Online www.heart2000.com.au
Price \$32.95
Requires Windows 95
Rating ■■■■■■■■



Xtreme Street Luge

Before you find the steepest hill in your neighbourhood and strap yourself onto an old skateboard, you might want to quench your daredevil thirst with this computer-simulated experience.

Xtreme Street Luge has eight courses. The controls are very basic and you must rely on fast reflexes to ensure that you don't crash into the barriers or other competitors. After a few practice runs, you'll be streamlining down the straights and taking corners at breakneck speeds. You can compete in four or six competitor seasons and prize money is awarded after each race. This prize money can then be used to upgrade your equipment.

Before embarking on a season, you can improve your skills with open-road practice sessions. These practice sessions can be more difficult than a real race as you



have to deal with traffic, police cars and other racers.

Xtreme Street Luge has three levels of difficulty, but the easiest one is far too easy. Different weather conditions add to the difficulty. Rain and snow blur your vision and make it hard to slow down.

The different courses provide some stunning scenery. Just be sure to concentrate on the road and not the landscape around you. Backing music is provided by the Offspring.

At first, Xtreme Street Luge is very exciting. However, the simple controls and similarity between courses mean that it quickly becomes boring.

Kieran McNamee

Contact Activision
Phone (02) 9869 0955
Online www.headgames.net
Price \$21.95
Requires Pentium 233, Windows 95, 64M RAM
Classification G(8+)
Rating ■■■■■■■■

Spot and His Friends

Who can resist Spot, the popular character from Eric Hill's children's stories? This title is designed for children aged two and up. Like the books, the content is very simple. From the opening scene in Spot's garden, you can choose between four stories, each containing three activities.

The stories run on their own until you get to an activity. In the beach story you build a sandcastle. You can choose the shape and colour of the castle, and decorate it with various pebbles and shells. The main activity for each story can also be accessed from Spot's garden, so if the child wishes to play it again, they can do so without having to run through the story again.

Toddlers will need an adult to help them through the voiceovers and activities, but



once they get the hang of clicking and moving the mouse, they can interact on their own. The cursor is in the form of a big red arrow. This makes it very easy to follow, and helps children understand how they are influencing the arrow with the mouse. There are voiceover instructions if you don't hit a key. If you don't complete an activity, a character from the story will finish it for you. The storyboards are clear and uncluttered, and are in bold, bright colours.

Spot and His Friends is sensibly priced for its content and is an excellent toddlers' introduction to interacting with computers.

Lindsay Hayman

Publisher Europress
Contact Hasbro Interactive
Phone (02) 9966 9899
Online www.funwithspot.co.uk
Price \$29.95
Requires Pentium 100, Windows 95, 16M RAM
Rating ■■■■■■■■

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- Use only specified bullets
- Do not play under 18 years of old

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APC's Best ever

FPS games are one of the most popular

Doom

If you've never played Doom, put down this magazine at once, find the nearest PC and report back in three hours. Wolfenstein started the craze, but Doom set the standard with great maps, intelligent monsters and a frantic multiplayer pace. It looks very dated now, but it's still addictive and a great deal of fun.



Duke Nukem 3D

What do you get if you cross the first destroyable environment with an attitude apparently created from every line Bruce Campbell ever said in an *Evil Dead* movie? You get Duke Nukem 3D.

While everyone else was scrambling for horror and deep, scary places, Duke Nukem reminded players that games should be fun, and (shock!) even funny. Duke Nukem 3D marked a shift towards adult humour and content in FPS games, and is yet to be outclassed.



Wolfenstein 3D

Join the cause! Fight the Nazi scourge in bitmapped glory! Just don't plan on looking up or down. Technically, Ultima Underworld beat Wolfenstein 3D to the first semi-3D first person shooter game, but it was

id's Nazi-blasting sensation that put FPS games at the top of the PC heap. Again, it looks dated, and the enemies are kinda stupid, but it's a classic nonetheless.



Goldeneye

The only non-PC FPS here, Goldeneye gets special mention both as the best yet console-based FPS, and as the best FPS based on a licence. Perfect Dark, the pseudo-sequel, uses the same setup, but it

doesn't continue the Bond theme, which isn't as appealing. If you like your games shaken, not stirred, Goldeneye is an essential purchase.



Unreal/Unreal Tournament

Just when it was looking like ID had the market sewn up, Epic's Unreal hit the market. You needed an insanely fast system to run it properly, but it demonstrated that all wall textures didn't need to be brown, and that relatively intelligent bots weren't just a pipe dream. The sequel took up Quake III's multiplayer approach. If that isn't your thing, give the original a spin.



Quake I - III

Quake is an institution for some people, an essential part of their computing experience. ID's masterpiece brought fully 3D worlds to life, albeit in rather dark and dingy colours a lot of the time. With two sequels, it's easy to find a version of Quake that'll run on your system — and if you're still stuck, there's always Doom.



first person shooters

genres in PC gaming today. APC takes a look at the highs and lows of the FPS scene.

Do not shoot at any hard surface to avoid rebounding



Half-Life

If you're tired of blasting, FPS advocates claim, you're tired of life. Half-Life proved that maxim wrong by linking a strong plot to the usual gore fest. Whether you liked the constantly



changing story-line and challenging puzzles, or delighted in leading stupid scientists to their inevitable (but funny) doom, Half-Life is a whole load of fun.

Outlaws

Another rare plot-based first person shooter, this polished production from LucasArts is set in the wild west. Its character and polish set it apart, despite the fact that the gameplay is fairly standard FPS fare



(sans rocket launcher). The plot is developed between levels by brilliant cut-scenes that are better than most seen before or since.

Tribes

The graphics and level designs of the multiplayer game Tribes work extremely well, even over slow connections. The weapons and jet packs make for great gaming. After playing late one night and relating war stories the next day, one APC staffer was surprised to discover that three of his nocturnal team mates were also from APC. This isn't just a case of nerds being nerds; Tribes is really *that* good.



Thief

The now-defunct Looking Glass Studios brought a new twist to the genre with this masterpiece. Rather than requiring you to kill all your enemies, the point of the game is to not get caught. You play Garrett, a thief with the ability



to hide in shadows, and a penchant for breaking into heavily guarded fortresses to steal valuable treasures. Occasionally it is necessary to club somebody from behind or go toe to toe in a sword fight. Thief lacks cutting-edge technology, but its gameplay and story are fantastic.

Honourable mentions

Soldier of Fortune, Rise of the Triad, System Shock 2 and Kingpin

Dishonourable discharges

Ken's Labyrinth

Blood

Catacomb

NAM

Hexen

Shadow Warriors



I, Robot

APC always takes pleasure in looking at the latest technology, but never in its 20-year history has it come so close to tech toy heaven. Darren Ellis ~~tests~~ plays with some of the robots available for the home.



When it comes to robotics, there are two kinds of people. The first, robot enthusiasts like myself, see robots and immediately want to play with them. When a bot does something that it's told to, we look at each other with a smile that says, 'Aren't people clever?'. We see robots as proof of the greatness of humankind, all wrapped up in moulded plastic and rubber.

The second group sees robots and says, 'Great. It moves. So what?'. Apart from a few dismal attempts in the 80s, there haven't been many robots available for the home until recently. Now there is a growing market for robots, from those that can help you domestically, to those that interact with you for fun. And we're not talking about Furbies.

What your bot can do for you

Cye-sr is one of the handiest home robots available. Instead of fitting this robot out with sensors, gadgets and gizmos, the manufacturer kept the design of Cye simple, and it works.

Cye moves around your house, bumping into things like the blind machine it is. From this halting exploration the robot begins to build up a picture of the layout of your house. It builds and uses this map from the Map-n-Zap software on your PC, which you use to control the robot through a serially connected radio transmitter.

You can attach a wagon (sold separately) to Cye. This has a convenient round indentation for a plate of food and two for drinks. The unit we played with didn't come with a wagon, but it did come with a cordless vacuum cleaner. This small cleaner — more like a DustBuster — plugs into Cye's back and is dragged behind it. Tell Cye where to vacuum, and it will turn the vacuum cleaner on, vacuum the area, turn the vacuum off and return to the recharger.

As one Cye owner in the US said, "While sitting on a couch, I can annoy or terrorise my dog whenever my evil side decides to take over. It may be a little cruel, but it gives me something to do during the commercials."

On the subject of pet harassment, the next robot takes things just a little further.



Robot! Kill the humans!

The Commandobot from MGA Entertainment in the US looks more like a traditional robot than Cye, but it has far fewer features. However, unlike Cye, the Commandobot comes with weapons. Standing 50cm tall, the Commandobot comes with flashing lights in its eyes, two lasers and eight missiles. This sounds like a fairly standard toy, but the Commandobot is voice controlled.

You have to train Commandobot to recognise your voice by donning the radio headset and repeating commands. The Commandobot is then yours to control. Voice commands are limited to a set of 11 simple commands

ability to learn and bond with people, and has 'emotions'. Looking at AIBO in brochures and on the Internet you get the impression that AIBO looks like a puppy and that's it. Once you see one in action — running excitedly after a ball, stretching as it wakes up, looking into your face to get you to play with it — you realise what a good job Sony has done with its robotic dog.

Each AIBO begins with a bare outline of a personality and, over time, it learns and grows through interaction, so no two AIBOs are the same. You can download different personalities from the Internet to try out in your AIBO, but few people do. As the manager of Sydney's Sony Life shop said "People get very protective of their AIBOs. Even if a leg breaks, some refuse to replace it, because 'it just wouldn't be Tiddles'".

It's alive!

If buying someone else's idea of what a robot should look and act like is not quite your thing, and you want to appease the mad scientist in you, there's the Mindstorms range from Lego. We all grew up playing with Lego blocks, but the Mindstorms range adds a humungous twist to building blocks. The base building block of your Mindstorm creation is the RCX — a computer that can be programmed on your PC using Lego's RCX Code.

Programmed to do what, exactly? Almost anything you want. That's the beauty of Mindstorms: it's a computer and a truckload of parts. You want to make a car that zips around the office? Go ahead. How about a machine for shuffling cards? You can do that too.

With over 700 pieces in the Robotics Explorer package, we were able to come up with all sorts of, well, junk. Given time, we

Where to buy

Cye-sr

Contact Probotics
Online www.probotics.com
Phone N/A
Price \$US995

Commandobot

Contact MGA Entertainment
Online www.mgae.com
Phone N/A
Price \$US89

Sony AIBO

Contact Sony
Online www.sony.com.au
Phone 1800 226 429
Price \$US2,500 (est)

Lego Mindstorms

Contact Myer Grace Bros
Online www.legomindstorms.com
Phone Contact nearest outlet
Price \$379

that work within a radio range of 15m. Applications for the Commandobot are limited to making it walk around and ordering it to fire missiles at people and pets, with the commands 'Release missiles' and 'Fire lasers'.

There's not a great deal for you to do with the Commandobot, but it's fun for kids and for adults who refuse to grow up. For the family that want to get into home robotics, there is always AIBO.

Puppy Love 2.0

AIBO is the home robot that has received the most publicity in the past two years. When it was first released, it sold out within half an hour. A second release of 10,000 bots sold out just as quickly. If you don't already own one, the only place you can now play with an AIBO in Australia is in a Sony Life shop.

AIBO is a robot puppy. It has the



Discover the history of telecommunications
and get the key to business success.

Back to the future

From the Wireless to the Web

This fascinating book, written by Australian Peter Jensen and subtitled *The Evolution of Telecommunications 1901-2001* marks the centenary of the first transatlantic radio signal. It takes the reader on an enlightening voyage from Charles Babbage's calculating machines to the future of microcommunications.

The Internet is the result of the merging of two technologies: telecommunications and the electronic computer. *From the Wireless to the Web* describes in detail how both technologies began and developed.

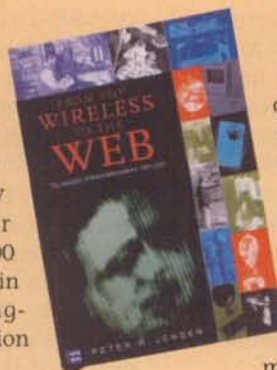
As well as providing a general coverage of the 20th century, the book has feature sections, such as 'Spark transmission methods' and 'Reception before valve', which provide in-depth explanations of various inventions.

The book also provides valuable insights into how chance and historical events influenced progress in communications. For instance, the sinking of the Titanic led almost directly to a revolution in world communication and broadcast-

ing. Because radio experimenters were interfering with official messages concerning the disaster, they were made to limit their broadcasting to within a 200 metre radius. This resulted in the development of long-distance radio communication at low power.

The relationship between communications and the two world wars is also described in detail, and rightly so, as the First World War saw rapid development and innovation in the field. Similarly, codebreaking is said to have won the Second World War for the Allies.

It was the threat of another world war, and the need to transfer data from computer to computer securely, that inspired the World Wide Web. Only five years after the World Wide Web became publicly available, the Internet is an accepted part of our lives. It's easy to believe the book's claim that wireless



communications is destined to change how live more dramatically than the industrial revolution changed people's lives in the 18th and 19th centuries.

The book contains a wonderful collection of illustrations and photographs, many of which have never been published before. This is really an encyclopedia of telecommunications, and is a great reference work on all the events, issues and people who shaped it.

Lindsay Hayman

Author Peter Jensen
Publisher UNSW Press
Contact UNSW Press
Phone (02) 9664 0900
Price \$55
ISBN 0868404586
Rating ■■■■■■■■

The Power of Now

How do you remain competitive and succeed in today's information-rich environment? How can your organisation operate in a market where real time equals zero time? How can it reduce its business processing cycles? The answer, according to author Vivek Ranadivé, is to become an event-driven company.

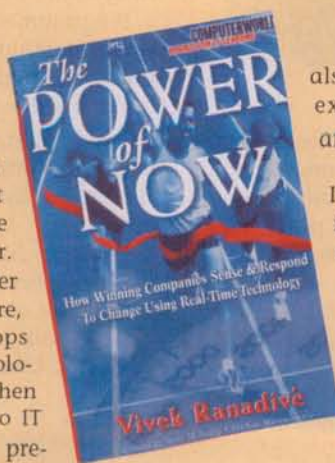
This book — subtitled *How Winning Companies Sense and Respond to Change Using Real-Time Technology* — brings together contemporary thinking on how to grow and drive businesses in the Internet economy. It addresses key issues including leadership, change management, technology, managing knowledge workers, and importantly, the ecosystem — competitors, customers and partners.

The book focuses strongly on the customer. "Better to know what your customer wants for breakfast than what your competitors served them," Ranadivé writes. The only disappointment is that there could have been more discus-

sion on overcoming barriers to change. Understanding what your organisation needs to do is one thing, but having the skills to make change happen is another.

Ranadivé is the founder and CEO of TIBCO Software, a company that develops real time software technologies. It's not surprising then that a chapter devoted to IT architecture is included, presenting a marketing opportunity for TIBCO. However, the bulk of this chapter is based on case studies of the work the company has undertaken in the financial markets.

The Power of Now has an extensive list of quality references from leading management and economics gurus such as Michael Porter, Peter Drucker, Fred Hilmer and Lester Thurow. There is



also a useful glossary that explains technical terms and acronyms.

This book is not just for IT professionals. It is an illuminating read for leaders and senior management who want to ensure their organisation is able to respond to market demands and pressures better than (and before) their competitors.

Cathie Kennedy

Author Vivek Ranadivé
Publisher McGraw Hill
Contact McGraw Hill
Phone (02) 9415 9899
Price \$53.95
ISBN 0071356843
Rating ■■■■■■■■

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PlayStation Magazine

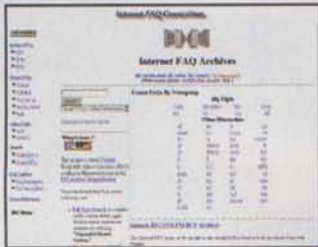
If you worship PlayStation
get the bible

Technically speaking

Where can you find the best technical support sites, online reference books and Usenet information? Daniel Rutter has put together a selection of Web sites that are useful, quick and easy to access and, most importantly, free.

Internet FAQ Consortium

There's a Usenet newsgroup for just about everything. In the comp.* and alt.comp.* hierarchies, you'll find someone to answer almost



Online www.faqs.org
Rating: ■■■■■■■■

any technical question. There's even a good chance some of the answers will be right. But it pays to check the FAQ (frequently asked question) files for relevant newsgroups first.

The FAQs are posted periodically to most groups, but they all have Web homes as well. The Internet FAQ Consortium gives you easy access to most of them.

Inquiry.com

One of many sites run by The Development Exchange (www.devx.com), this is essentially a large, searchable database of pithy articles by inhouse experts on various PC and Internet development subjects: popular PC programming, Internet script languages, Microsoft operating systems, database development. It's not a comprehensive list of information for programmers, but there's every chance you'll find what you're looking for.



Online www.inquiry.com
Rating: ■■■■■■■■

The PC Guide

Charles M Kozierok's online PC reference work is a comprehensive and comprehensible guide to PC hardware.



Online www.pcguides.com
Rating: ■■■■■■■■

It's not terribly up to date (you won't find the latest hard drive controller standard here), but it's easy to navigate and covers every part of almost any PC in a no-nonsense way. The PC Guide also provides the background information you'll need to come to grips with PC systems that you're unfamiliar with.

Linux Help Online

This site is an excellent starting point for Linux information. Linux Help Online, like every other Linux portal, has links to all the FAQs and HOWTOs as well as other handy Web sites. It also has a useful Knowledge Base which brings a lot of information together in one place.



Online www.linuxhelp.org
Rating: ■■■■■■■■

The Linux Help discussion forums are nothing special, but the rest of the site should be your first port of call when you need a Linux question answered.

Webopedia

Dubbed the 'online computer dictionary for Internet terms and technical support', Webopedia is a natural companion to



Online webopedia.internet.com
Rating: ■■■■■■■■

FOLDDOC (Free On-Line Dictionary of Computing), but it's definitions are easier to understand and it has better coverage of new consumer technologies. There are also lots of links. A quick investigation of Webopedia is likely to turn up that elusive fan site or an FAQ about whatever's been irking you.

Intel Support

This is the first site you should visit for Intel drivers, bug reports, datasheets and so on. It's brand-specific, so don't expect to find information on why your no-name network card isn't working properly on your Intel motherboard.



Online support.intel.com
Rating: ■■■■■■■■

Intel has proper newsgroups in the intel.* hierarchy. You don't have to visit the site to read or post to these newsgroups — any newsreader can do it — but you can read and post via a simple Web interface from Intel's site.

Microsoft Product Support Services

This is Microsoft's main support page, with links to its file downloads, FAQs and contact numbers, as well as the searchable Support Knowledge Base. You can go to the Knowledge Base by typing in search.support.microsoft.com.



Online support.microsoft.com/directory
Rating: ■■■■■■■■

It used to be impossible to find what you were looking for on Microsoft's site. It's still too crowded, but it's now more navigable and works well, as long as you've got a fairly recent browser. Microsoft also has a Personal Online Support page at support.microsoft.com/support, which is tailored for ordinary users.

Annoyances.org

Creative Element's Annoyances.org is the online companion to its popular Annoyances series of books. The site is divided up into Windows 95 Annoyances and Windows 98 Annoyances. Windows 2000 Annoyances is promised for the future.



Online www.annoyances.org
Rating: ■■■■■■■■

It is a hefty database of things that are annoying about both operating systems, and what you can do about them. Annoyances.org isn't comprehensive, but it covers all the common Windows 95/98 questions. It also covers a respectable selection of the more esoteric ones.

WinDrivers.com

This site is a useful searchable archive of links to Windows drivers for all sorts of PC hardware. However, many off-brand gadgets aren't listed under the brand name you'll find on their box, and may not be listed here at all.



Online www.windrivers.com
Rating: ■■■■■■■■

For video cards, at least, all you need to know is the chipset the card uses. Go to the chipset manufacturer's site to get the 'reference' drivers and you're in business, but don't expect any of your card's fancy extra features to work. The same goes for other gear based on widely used chipsets — network cards and some soundcards, for instance.

AppleCare Tech Info Library

The AppleCare Tech Info Library is a sleeker, easier-to-use version of Microsoft's Knowledge Base for Macs. It covers setup and troubleshooting information for all kinds of Macs, along with a substantial amount of third-party hardware and software. You



Online til.info.apple.com
Rating: ■■■■■■■■

will also find technical articles on a range of Mac issues, and information and tips on the latest Mac OS.

The Tech Info Library is very comprehensive, just like Microsoft's Knowledge Base, but it's faster and doesn't have the 'we did this just because we could' frills that Microsoft keeps pasting all over its sites.

MacFixIt

This site offers wall-to-wall Macintosh troubleshooting information, with an easy-to-use search interface. It's really just a big archive of MacFixIt newsletters going back to 1996. The newsletter is half Weblog, half news and views, and is well written and fairly up to date.



Online www.macfixit.com
Rating: ■■■■■■■■

MacFixIt's forums are also worth a visit. Many tech sites have rather quiet discussion areas, but MacFixIt's bulletin boards are more like Usenet.

There's also a software download section with a small collection of the best freeware and shareware utilities.

Experts Exchange

Experts Exchange is a programmer-oriented mini-Usenet with a novel points system. When you create an Experts Exchange account you receive 75 points, and accrue five points each day for free. When asking a question, you assign points to it according to



Online www.expertsexchange.com
Rating: ■■■■■■■■

how important you think it is. If someone answers the question satisfactorily, they get the points. You can accrue points by answering other people's questions, or you can stay out of the economy altogether and just search the list of already answered questions. The points system indicates whether someone is an expert, and it provides a filter for past answers.

Dawn of a revolution

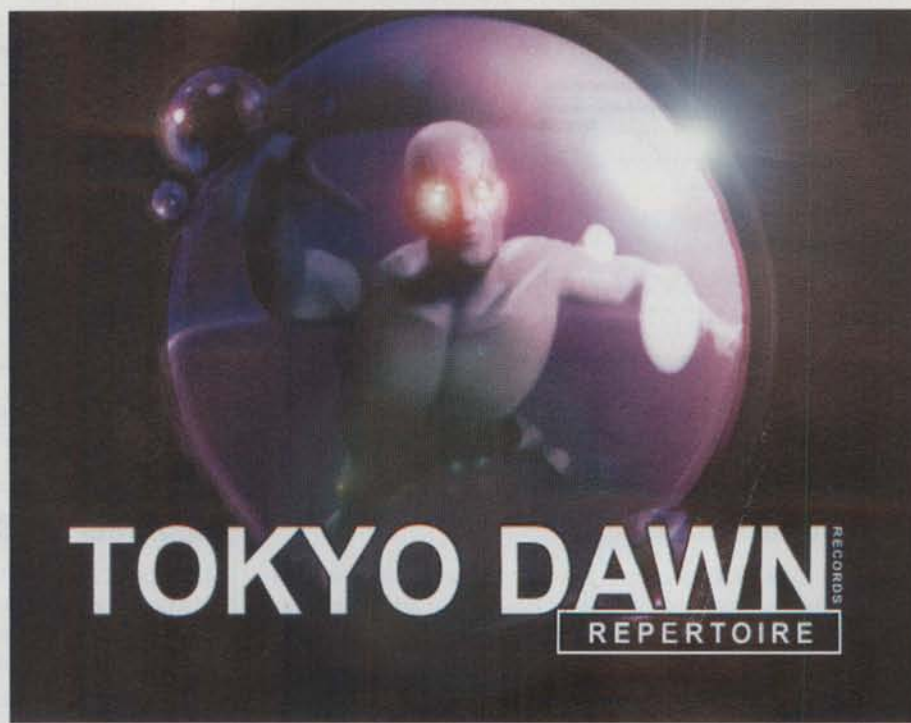
Tokyo Dawn Records (TDR) was born in 1997 after a group of friends at a party in Germany came up with the idea of using a Net label for distributing tracks — free and direct to an online audience. The label quickly developed into an international project, but it continues to be driven by the friendship between its members and their dedication to the music.

As the Tokyo Dawn site (www.tdr.scene.org) explains, "our music is completely free and this allows the TDR artists to reach the public without having to struggle through any corporate structures and without having to change the music in any way." The site also includes an excerpt from Balilla Pratella's revolutionary *Manifesto of Futurist Musicians* (1910), which appeals to the young to rebel and reject the commercial and academic worlds.

The label's organiser, known as Prymer, describes TDR's music as "contemporary breakbeat eclecticism", ranging from drum and bass to funky breaks and hip hop instrumentals. TDR has also spawned a techno label called Tokyo2051.

TDR is truly eclectic, as it is selective about what it releases. "We deliberately try to escape categories, there's much more content behind music than just keeping a certain tempo and style; after all, we're constantly progressing and evolving, trying not to stand still. Since we are free and independent, we can choose for ourselves what we want to release and what not."

Most TDR artists live in Germany, but there are also some in the Netherlands, Eng-



land, Finland and Poland. The label has also had guest releases from other countries including Australia, Russia and the US. "It doesn't really matter from which part of the world the people contact us. We primarily keep in touch via email, but now and then try to find possibilities to meet up."

Established Net labels such as TDR have their roots in the demo scene. Although the scene has diminished in recent years, demo parties were a huge underground phenomenon from the mid-'80s to the mid-'90s. Hundreds or thousands of people would gather to show off demonstration programs they had created. In the early days the most popular demo machines were the Commodore Amiga, Commodore 64 (C64) and Atari 520ST, but from the early '90s, PCs became more popular. Demo programs are often a group

effort, involving coders, graphic designers and musicians using mod (music module) trackers. Bulletin boards and floppy disks used to be the main way of distributing demos, and many demos can still be found on Web and FTP sites.

When TDR started, all the artists used simple tracker programs for making music. At

the time, mods were extremely popular in the demo scene, because they provided a cheap way of making music with reasonable sound quality. "Mod trackers allowed you to handle samples well,

but didn't have many other possibilities to offer," Marc said. "Most of us have switched to other music software systems during the years (either Buzz, Generator or Cubase, whatever). Some of us also play instruments, DJ, or even study audio technology. We're nevertheless trying our best to keep



Artists from Tokyo Dawn Records spoke to APC about the future of free music. Is there too much on the Net?



that open source idea alive at TDR and in the tracker scene in general."

Music formats such as MP3 have helped TDR to distribute music free to a large global audience. "To make a CD, you need money and have to produce a certain amount. Copying MP3s does not cost anything," TDR's Looza said.

"The other great thing about the Net and MP3 is that it's global. There may be a surf-rock band in Iceland, which may have no audience in their home town and so they never have the need to make a CD, but it may be that some Japanese students totally admire them, and with MP3 they can deliver their fans fresh music, no matter where they live or how many fans there are."

Aside from MP3s, TDR releases tracks as mod files (for instance, in XM and IT formats), which some people prefer because they are small, high-quality files that allow you to see how the track was made.

MP3 has changed the Internet, and not all the effects have been positive. Looza is ambivalent about its impact. "On one hand, MP3 is great, everyone can now publish their music, and sites such as MP3.com help a lot with that. On the other hand, I personally think sometimes that there is too much music on the Net. It can be very hard to find really good music on MP3.com, and their charts are no real help there. All in all, I think their way of organising charts and 'Payback for Playback' is a bit unfair."

Looza sees one other major drawback with sound files. "MP3 is pure music, and other things we link to music such as cover design and videos are not easily possible

with MP3. Of course you can pack your music with a small JPEG, but it is not the same as something like an album cover. The idea of music as an 'art package', containing music and visuals and text in the insert, is not possible with MP3; MP3 is stripped naked music. As most people still prefer this kind of art package, I guess the music industry won't have too many problems with MP3s."

TDR is one of several Net labels to have gained a reputation for high-quality releases. These labels provide an alternative to listening to hours of music to find a few great tracks. Some of the TDR artists have music released on conventional record labels, and Prymer manages a vinyl label with friends (see www.gutbucket.de), but TDR artists keep coming back to the

rewards of sharing their music over the Net. "We enjoy working on a small, indie level without things getting businesslike or fake". TDR has music in various formats for download on its own site, and early this year began expanding its audience by listing tracks on MP3.com (see www.mp3.com/tokyodawn).

"We don't gain loads of downloads or high ranking in the charts, but the small amount of money we earn there is needed for our own Web space," Prymer said. TDR also has two CDs in the works, which will be available from MP3.com. "This isn't a sell-out as some might think, we're just trying to get a few of our costs in so that we can continue running TDR without having to place ads on our page and without having to seek a sponsor."

Vanessa Richardson



Tracks and artists

Tokyo Dawn Records provided the following 10 tracks for this month's cover CD.

- Falcon: 'Ma' Eyez Wide Open'
- Keith303: 'Tentacle Observer'
- Krii: 'Dzaes Manouverz'
- Kritix: 'Votecheat'
- Looza: 'Linking Worlds'
- Mentz: 'Keepin' it Kool'
- Optic: 'Removal Syndrome'
- Prymer: 'Blur Reality'
- Simon V: 'Rainclouds'
- Twister: 'The Journey of Mr Reefer'



These tracks are on CD 1 in this month's cover CD pack, along with more detailed profiles of the artists. For more information about Tokyo Dawn Records or to download additional tracks, visit www.tdr.scene.org or www.mp3.com/tokyodawn.

The GST: What do you think?

The advent of the GST has seen the price of PCs come down, but other costs — such as software and ISP access — have gone up. How have your computer habits changed since the advent of GST?



"It's not too bad. I've simply got to balance the added cost of my new hardware and software against the total GST payable to the ATO when I do my quarterly payment submission. Oh hell, now I've missed *Backyard Blitz*."

Melissa Howorth, retailer



"To save on my Internet access costs, I'm now getting off to online porn 10% faster."

Eric Sidle, systems analyst



"I couldn't afford a computer anyway, so I've tied together these two cans with a piece of string and some foil to make my own high-tech videoconferencing system."

Ronald Watson, retiree



"Like most Australian families, we're actually better off under the GST. No, honey, Fido won't be back any time soon. Now sit down and eat your meat loaf."

John Sudin, builder's labourer



"I'm still able to afford hot new computer software and hardware, because I've cut down on my music costs by installing Napster. Kid Rock rules!"

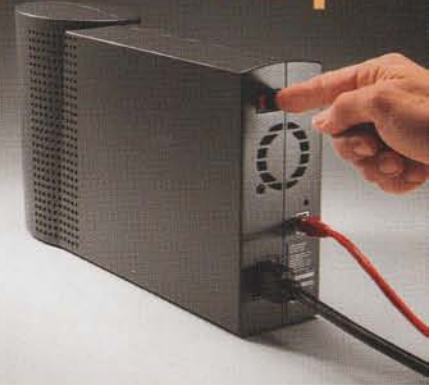
Jan Fickle, teacher



"Spiralling Net access charges killed my cyber-romance. But we'll always be together, however far it seems. We'll always be together, together in electric dreams."

Frank Wogan, stockbroker

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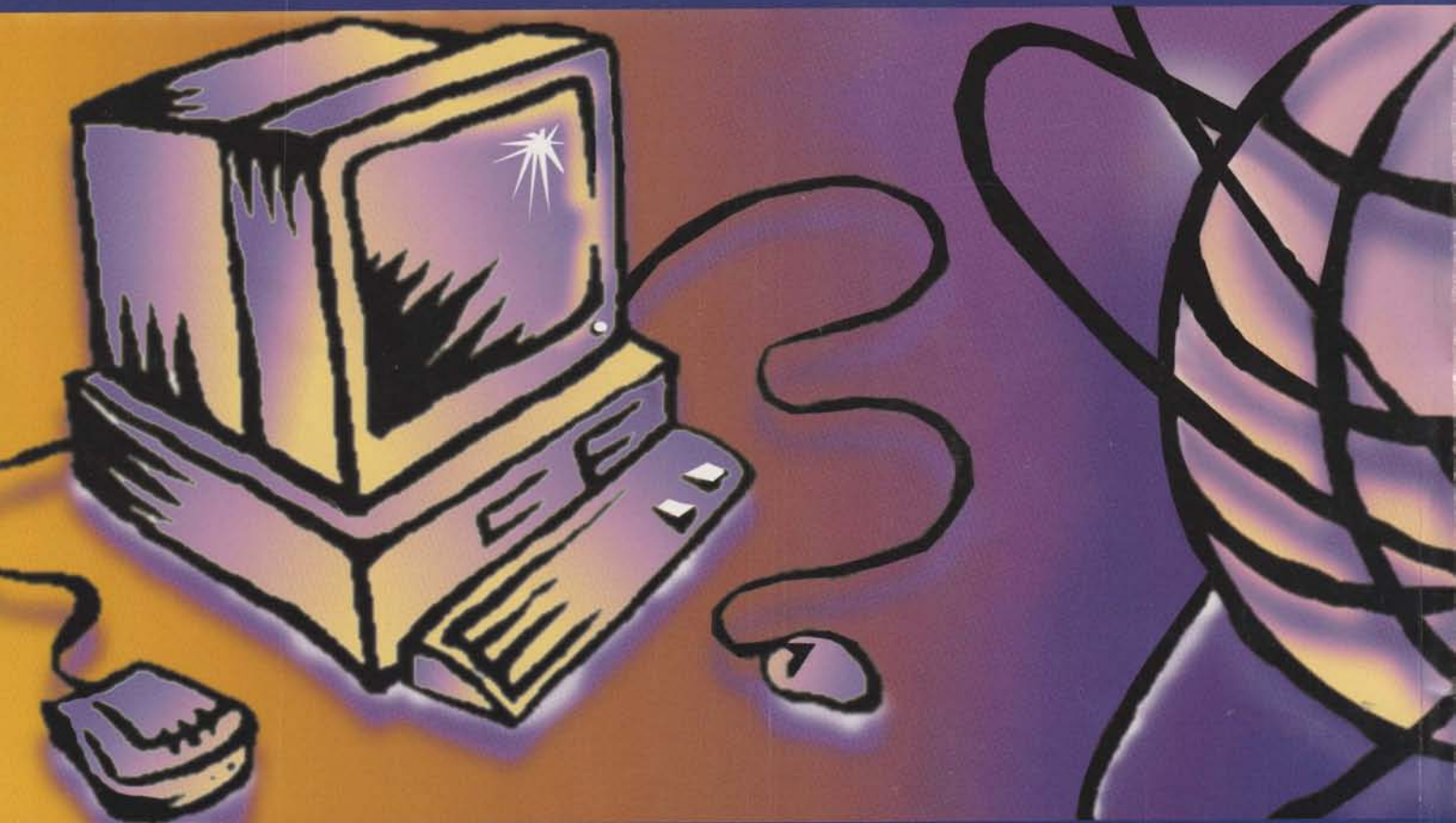
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